DISTRIBUTION SHEET

To	From	Page 1 of 1
DISTRIBUTION	STATION 22	Date
Project Title/Work Order		EDT No.
FFTF		ECN No. 622377

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
TECHNICAL REFERENCE CENTER	N2-12	X			
CENTRAL FILES ORIG + 2	L8-04	X			
OSTI (2)	L8-07	X			
KE WALTER	N2-05	X			
NC HOITINK	N2-05	X			

NHSEF

ENGINEERING CHANGE NOTICE

Page 1 of 3

1. ECN No 622377

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	3a. USQ Required?	4. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	KE WALTER, FFTF, N2-05, 376-0638	[X] Yes [] No	5/4/95
	5. Project Title/No./Work Order No. FFTF	6. Bldg./Sys./Fac. No. 4717/23J/400	7. Approval Designator NA
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-FF-CSWD-055, REV 0 WHC-SD-FF-CSWD-056, REV 0	9. Related ECN No(s). NA	10. Related PO No. NA

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	NA	NA Cog. Engineer Signature & Date	NA Cog. Engineer Signature & Date

12. Description of Change

Revision 1 documents are complete replacements for revision 0 documents referenced in block 8.

13a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

Logic software design changes were required to allow automatic starting of a compressor that had not been previously started.

14. Distribution (include name, MSIN, and no. of copies)

KE WALTER, N2-05 [1]
NC HOITINK, N2-05 [1]

CENTRAL FILES, L8-04 [2]
OSTI (2), L8-07

RELEASE STAMP

OFFICIAL RELEASE BY WHC DATE JUN 08 1995

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5fa 22

A-7900-013-2 (11/94) GEF095

ENGINEERING CHANGE NOTICE	Page 2 of 3	1. ECN (use no. from pg. 1) 622377

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[X]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
H-4-302183 Rev 1		

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer KE Walter KE Walter	5/4/95	PE	
Cog. Mgr. NC Hoitink N.C. Hoitink	5/4/95	QA	
QA		Safety	
Safety		Design	
Security		Environ.	
Environ.		Other	
Projects/Programs			
Tank Waste Remediation System			
Facilities Operations		DEPARTMENT OF ENERGY	
Restoration & Remediation		Signature or Letter No.	
Operations & Support Services			
IRM		ADDITIONAL	
Other			

UNREVIEWED SAFETY QUESTION SCREENING FORM

REFERENCE ITEM # ECN 622377

TITLE AIR COMPRESSOR CONTROL LOGIC SOFTWARE REVISION 1

QUESTIONS

Does the referenced item:

A. Make PROPOSED CHANGES to the facility or procedures which differ from conditions described in the AUTHORIZATION BASIS?

N/A____ NO X Yes/Maybe____

Basis: This ECN makes no physical changes to installed operating plant equipment or procedures. Support Document changes made by this ECN depict a change in only one logic function of the air compressor control panel Programmable Logic Controllers.

B. Describe an event or condition (DISCOVERY) which differs from those described in the AUTHORIZATION BASIS? N/A X NO____ Yes/Maybe____

Basis: _____

C. Describe tests or experiments which differ from those described in the AUTHORIZATION BASIS? N/A X NO____ Yes/Maybe____

Basis: _____

NOTE: This form is not to be used for PHYSICAL PLANT MODIFICATIONS.

QUSQE #1 KE Walter
(print name)

K E Walter
Signature Date 5/4/95

QUSQE #2 M. J. CONTINI
(print name)

M. J. Contini
Signature Date 5/4/95

RELEASE AUTHORIZATION

Document Number:	WHC-SD-FF-CSWD-056, Rev. 1
Document Title:	R-189 (C-620) AIR COMPRESSOR CONTROL LOGIC SOFTWARE DOCUMENTATION
Release Date:	6/2/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Chris Willingham

C. Willingham 6/2/95

SUPPORTING DOCUMENT

1. Total Pages 43

2. Title
R-189 (C-620-C) AIR COMPRESSOR CONTROL LOGIC, COMPUTER SOFTWARE DESCRIPTION

3. Number
WHC-SD--FF-CSWD-056

4. Rev No.
1

5. Key Words
R-189, C620-C, PLC, SOFTWARE

6. Author
Name: KE WALTER
KE Walter
Signature
Organization/Charge Code 18240/B181A

7. Abstract

The purpose of this document is to provide an updated Computer Software Description for the software to be used on R-189 (C-620-C) air compressor programmable controllers.

8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

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10. RELEASE STAMP

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9. Impact Level ANA KEW 6/8/95

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MASTER

RECORD OF REVISION	(1) Document Number WHC-SD-FF-CSWD-056	Page 1.

(2) Title

R-189 (C-620C) AIR COMPRESSOR CONTROL LOGIC SOFTWARE DOCUMENTATION

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
	(7) WHC-SD-FF-CSWD-056 REVISION 0, EDT 606194, 8/15/94		
RS 1	COMPLETE REPLACEMENT FOR REVISION 0 PER ECN 622377 KCW 6/6/95	KE WALTER KE Walter	NC HOITINK N.C. Hoitink 5/4/95

COMPUTER SOFTWARE DESCRIPTION

Document No. WHC-SD-FF-CSWD-056 Revision No. 1

1.	Impact Level:	NA
2.	Software Name:	R-189 (C-620-C) AIR COMPRESSOR CONTROL LOGIC
3.	Requirements Documents:	WHC-S-1081 Specification for Replacement Control Panels for FFTF Plant Air Compressors. H-4-302182, Electrical Elementary Wiring Schematic. H-4-302183, Electrical Logic Diagram.
	Design Description Document:	(Same as #3 above)
	User Document:	Operation Procedures for operation of R-189:
4.	Software Custodian:	Kenneth E. Walter
	Custodian Organization:	FFTF ASEE
	Software Location:	FFTF Engineering & FFTF SOM
5.	Interfaces:	
	Hardware Platform:	GE Programmable Logic Controller (PLC), Series 90-30
	Operating System:	Development - Any Dos platform, with DOS 3.1 or later. System - Embedded in EEPROM within the PLC *
	Development Tools:	GE-Fanuc Logicmaster 90-30/205 Serial Software Package
	Libraries:	Not Applicable *
6.	Number of Source Files:	Not Applicable *
7.	Approximate Lines of Code:	Not Applicable *
8.	Data on Source Files:	Not Applicable *

* A GE PLC, Series 90-30, installed as part of C-620-C, controls the R-189 Air Compressor. The PLC is programmed using the GE-Fanuc Logicmaster 90-30/205 Serial Software Package.

The GE-Fanuc Logicmaster 90-30/205 Serial Software Package provides for:
- Offline PLC software development & modification
- Storage of PLC software programs on disk, as "folders"
- Loading of the software into the PLC
- Program Documentation

The Logicmaster Folder which contains the programming for the C-620-C is designated "AC_R189".

```
  GGGG EEEEE       FFFFF  AAA  N   N U   U  CCCC
 G     E           F     A   A NN  N U   U C
 G GGG EEEE        FFF   AAAAA N N N U   U C
 G   G E           F     A   A N  NN U   U C
  GGG  EEEEE       F     A   A N   N  UUU   CCCC


  AAA  U   U TTTTT  OOO  M   M  AAA  TTTTT IIIII  OOO  N   N
 A   A U   U   T   O   O MM MM A   A   T     I   O   O NN  N
 AAAAA U   U   T   O   O M M M AAAAA   T     I   O   O N N N
 A   A U   U   T   O   O M   M A   A   T     I   O   O N  NN
 A   A  UUU    T    OOO  M   M A   A   T   IIIII  OOO  N   N
```

```
(*****************************************************************************)
(*                                                                           *)
(*                           Program:  AC_R189                               *)
(*                                                                           *)
(*      PLC PROGRAM ENVIRONMENT                HIGHEST REFERENCE USED        *)
(*   ---------------------------------       --------------------------      *)
(*                INPUT (%I):      512                   INPUT:   %I0101     *)
(*               OUTPUT (%Q):      512                  OUTPUT:   %Q0261     *)
(*             INTERNAL (%M):     1024                INTERNAL:   %M0100     *)
(*          GLOBAL DATA (%G):     1280             GLOBAL DATA:     NONE     *)
(*            TEMPORARY (%T):      256               TEMPORARY:     NONE     *)
(*             REGISTER (%R):     1024                REGISTER:   %R0057     *)
(*       ANALOG INPUT (%AI):        64            ANALOG INPUT:   %AI0033    *)
(*      ANALOG OUTPUT (%AQ):        32           ANALOG OUTPUT:     NONE     *)
(*                                                                           *)
(*                  PROGRAM SIZE (BYTES):      1184                          *)
(*                                                                           *)
(*                                                                           *)
(*****************************************************************************)
```

```
(*****************************************************************************)
(*                                                                           *)
(*                              BLOCK:  _MAIN                                *)
(*                                                                           *)
(*                                                                           *)
(*                          BLOCK SIZE (BYTES):  1174                        *)
(*                       DECLARATIONS (ENTRIES):   158                       *)
(*                                                                           *)
(*                                                                           *)
(*                       HIGHEST REFERENCE USED                              *)
(*                      ------------------------                             *)
(*                                                                           *)
(*                             INPUT (%I):   %I0101                          *)
(*                            OUTPUT (%Q):   %Q0261                          *)
(*                          INTERNAL (%M):   %M0100                          *)
(*                        GLOBAL DATA (%G):      NONE                        *)
(*                          TEMPORARY (%T):      NONE                        *)
(*                          REGISTER (%R):   %R0057                          *)
(*                       ANALOG INPUT (%AI):   %AI0033                       *)
(*                      ANALOG OUTPUT (%AQ):      NONE                       *)
(*                                                                           *)
(*****************************************************************************)
```

[START OF LD PROGRAM AC_R189] (* *)

[VARIABLE DECLARATIONS]

V A R I A B L E D E C L A R A T I O N T A B L E

REFERENCE	NICKNAME	REFERENCE DESCRIPTION
%I0001		UNDER VOLTAGE TRIP
%I0002		UNDER VOLTAGE TRIP RESET
%I0003		NO ELECT FAULT
%I0004		AIR COMP RUNNING
%I0005		MODE TWO SELECTD
%I0006		MODE THREE SELECTD
%I0007		AIR COMP AUTO SWITCH
%I0008		AIR COMP START SWITCH
%I0033		SHUTDWN RESET PB
%I0034		ALARM TEST PB
%I0035		ALARM ACK PB
%I0036		ALARM RESET PB
%I0037		OIL PRESSUR NOT LOW
%I0038		OIL LEVEL NOT LOW
%I0039		OIL TEMP NOT HIGH
%I0040		AIR TEMP NOT HIGH
%I0065		CNDNSAT LEVEL NOT HIGH
%I0066		NO VIBRATN
%I0067		DISCHRG PRESSUR NOT HIGH
%I0068		DISCHRG TEMP NOT HIGH
%I0070		AFTRCLR CNDNSAT LEVEL NOT HI
%I0071		RESET PB
%I0072		AIR COMP RUN SWITCH
%I0097		AIR COMP LOCAL SWITCH
%I0098		R1 COMMON ALARM OFF
%I0099		R2 COMMON ALARM OFF
%I0100		R1 NO LOW LOW LOW PRESSUR
%I0101		R2 NO LOW LOW LOW PRESSUR
%Q0161		AIR COMP RUN COIL
%Q0162		STOP COOLING WATER FLOW
%Q0164		UNLOAD SOLENOID
%Q0165		ALARM LIGHT
%Q0166		ALARM LIGHT
%Q0167		ALARM LIGHT
%Q0193		ALARM LIGHT
%Q0194		ALARM LIGHT
%Q0195		ALARM LIGHT
%Q0196		ALARM LIGHT
%Q0197		ALARM LIGHT
%Q0198		ALARM LIGHT
%Q0200		ALARM HORN
%Q0225		COMP RUNNING
%Q0226		COMP NOT RUNNING
%Q0227		VIB. SWITCH RESET COIL
%Q0257		PRESSUR NOT LOW LOW LOW ALARM

%Q0258	NO COMMON ALARM
%Q0261	AFTRCLR CNDNSAT LEVEL NOT HI
%M0001	AIR COMP RUN
%M0002	LOW OIL PRESSUR
%M0003	LOW OIL LEVEL
%M0004	HIGH CNDNSAT LEVEL
%M0005	HIGH AIR PRESSUR
%M0006	HIGH AIR TEMP
%M0007	HIGH OIL TEMP
%M0008	LOW OIL PRESSUR ALARM LATCH
%M0009	LOW OIL LEVEL ALARM LATCH
%M0010	VIBRATN ALARM LATCH
%M0011	HIGH CND LVL ALARM LATCH
%M0012	HI AIR PRESSUR ALARM LATCH
%M0013	HI AIR TEMP ALARM LATCH
%M0014	HI OIL TEMP ALARM LATCH
%M0015	ELECT FAULT ALARM LATCH
%M0016	HI DISH AIRTEMP ALARM LATCH
%M0017	LOW OIL PRESSUR ALARM ACK
%M0018	LOW OIL LEVEL ALARM ACK
%M0019	VIBRATN ALARM ACK
%M0020	HIGH CND LVL ALARM ACK
%M0021	HI AIR PRESSUR ALARM ACK
%M0022	HI AIR TEMP ALARM ACK
%M0023	HI OIL TEMP ALARM ACK
%M0024	ELECT FAULT ALARM ACK
%M0025	HI DISH AIRTEMP ALARM ACK
%M0026	ALARM FLASH ON
%M0027	ALARM FLASH OFF
%M0028	ALARM HORN PART 1
%M0029	UNDER VOLTAGE TRIP LATCH
%M0030	UV TRIP
%M0031	UNDER VOLTAGE TRIP OK
%M0032	COMMON ALARM PART 1
%M0033	COMMON ALARM
%M0034	COMMON ALARM LATCH
%M0035	AIR PRESSUR HIGH
%M0036	AIR PRESSUR LOW
%M0037	AIR PRESSUR LOW LOW
%M0038	AIR PRESSUR LOW LOW LOW
%M0039	PRESSUR BELOW MODE SP
%M0040	DELETED ON REV. 1
%M0041	COMPRSR OFF DELAY
%M0042	RUNNING UNLODED TIMER
%M0043	VIBRATN ALARM
%M0044	ELECT FAULT
%M0045	HIGH DISCHRG AIR TEMP
%M0046	R1 COMMON ALARM ONESHOT
%M0047	R2 COMMON ALARM ONESHOT
%M0048	R189 COMMON ALARM ONESHOT
%M0049	COMMON ALARM ONESHOT LATCH
%M0050	COMMON ALARM REFLASH TIMER
%M0051	TIMER RESET (OS)

%M0052	PRESS BELOW SP (OS)
%M0053	RUNNING CONTACT DELAY TIMER
%M0054	ALARM LATCH
%M0055	ALARM LATCH
%M0100	C-187 CONTROL SWITCH LATCH
%R0001	TIMER
%R0002	TIMER
%R0003	TIMER
%R0004	TIMER
%R0005	TIMER
%R0006	TIMER
%R0007	TIMER
%R0008	TIMER
%R0009	TIMER
%R0010	TIMER
%R0011	TIMER
%R0012	TIMER
%R0013	TIMER
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%R0037	TIMER
%R0038	TIMER
%R0039	TIMER
%R0040	TIMER
%R0041	TIMER
%R0042	TIMER
%R0043	TIMER
%R0044	TIMER
%R0045	TIMER
%R0046	TIMER
%R0047	TIMER
%R0048	TIMER

%R0049	TIMER
%R0050	TIMER
%R0051	TIMER
%R0052	TIMER
%R0055	HPLSL ON DEL. TIMER REV. 1
%AI0033	PRESSUR XMTR

I D E N T I F I E R T A B L E

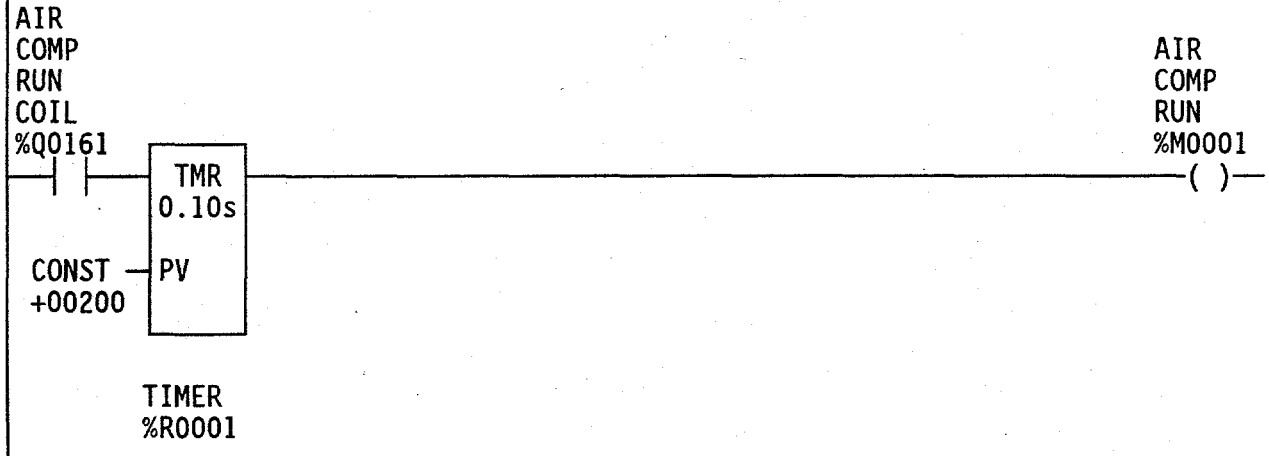
IDENTIFIER	IDENTIFIER TYPE	IDENTIFIER DESCRIPTION
AC_R189	PROGRAM NAME	

[BLOCK DECLARATIONS]

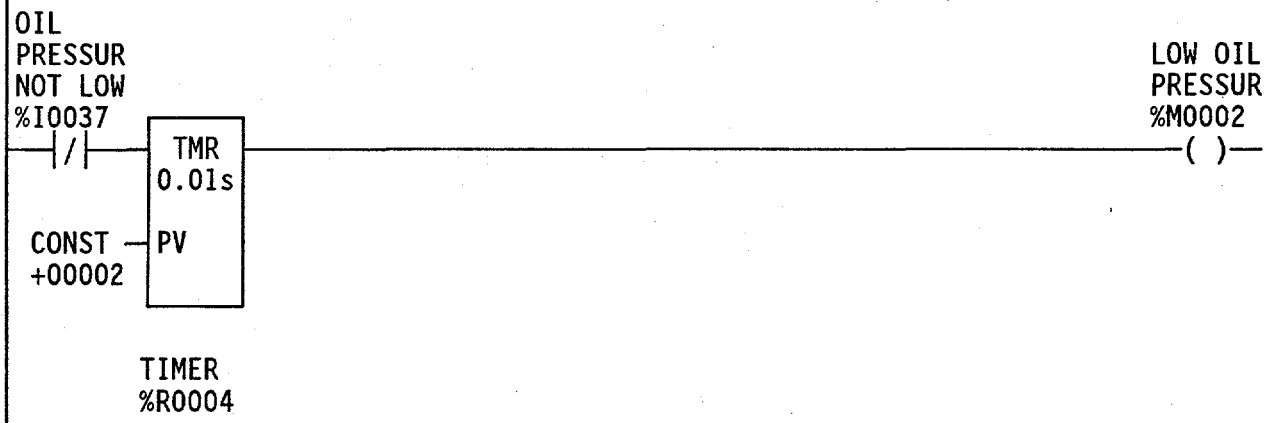
[START OF PROGRAM LOGIC]

```
(*****************************************************************************)
(* ALARM DELAY TIMERS                                                        *)
(*****************************************************************************)
```

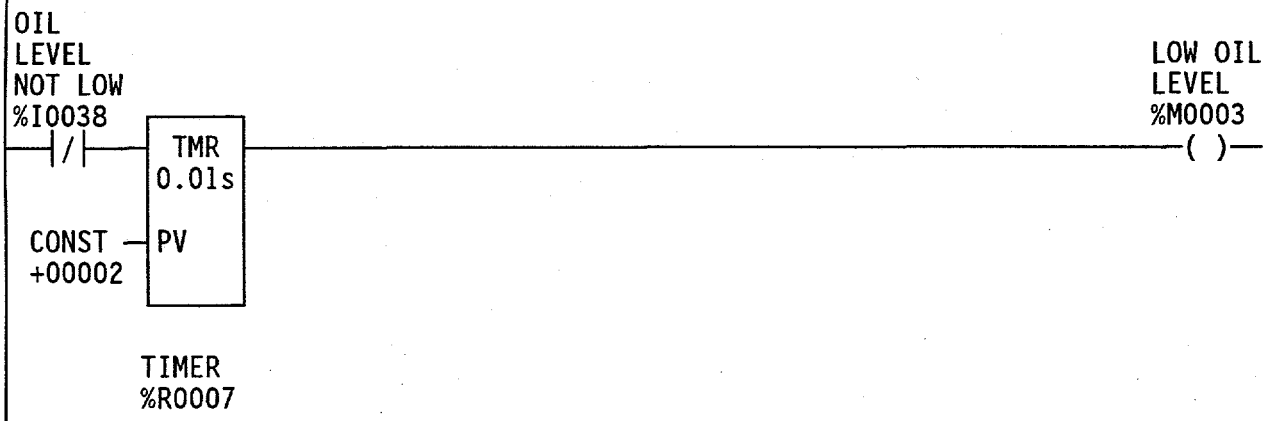
<< RUNG 5 STEP #0002 >>



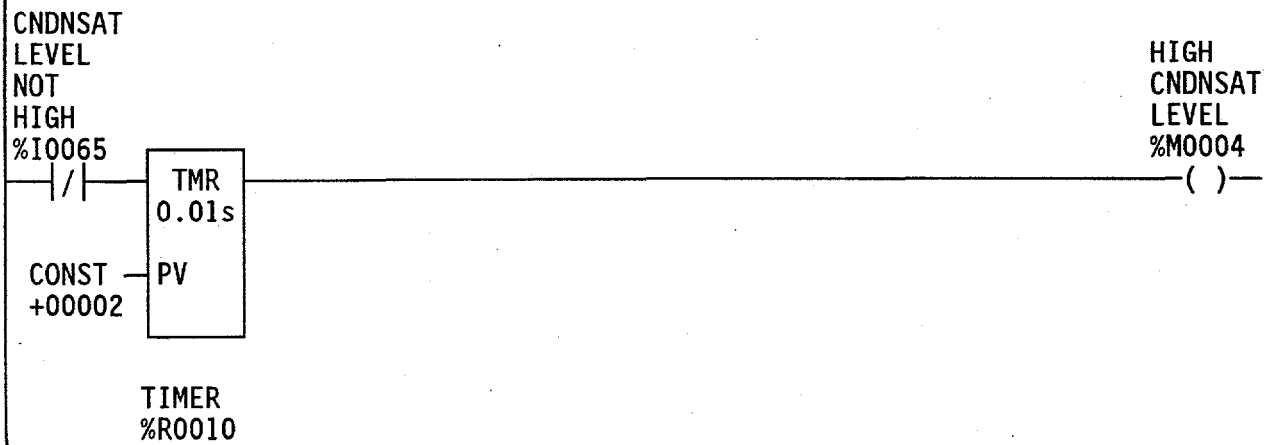
<< RUNG 6 STEP #0005 >>



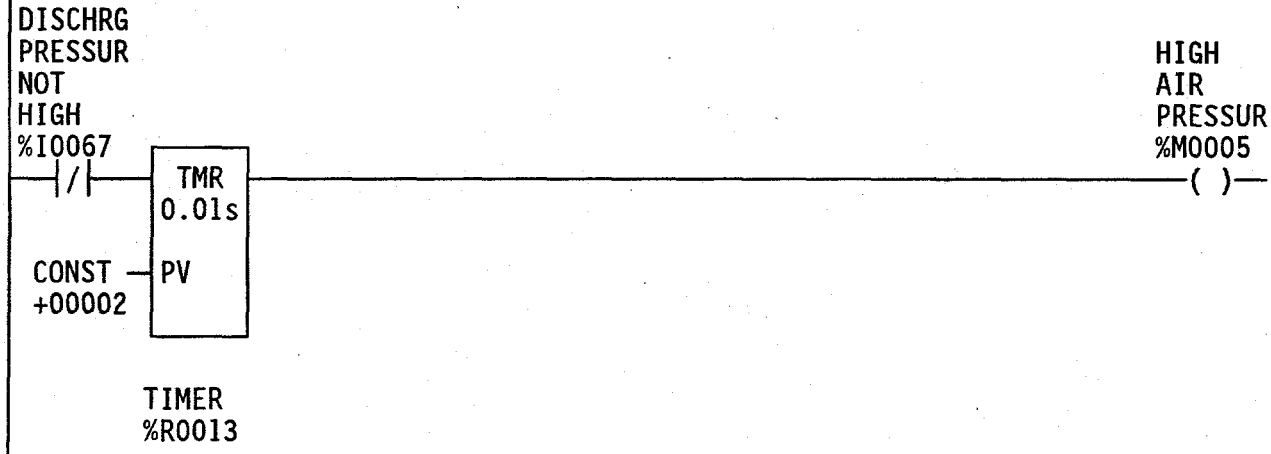
<< RUNG 7 STEP #0008 >>



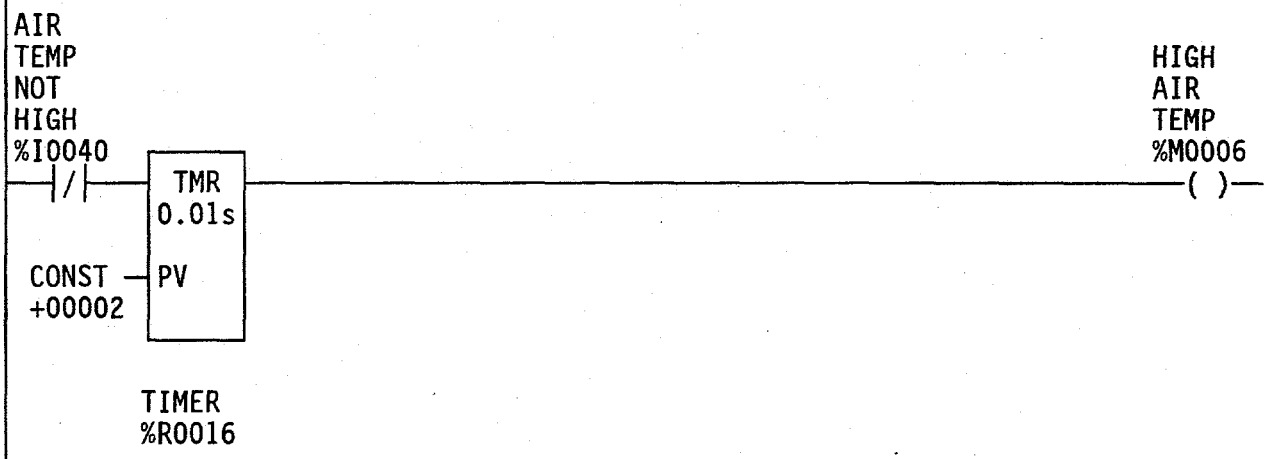
<< RUNG 8 STEP #0011 >>



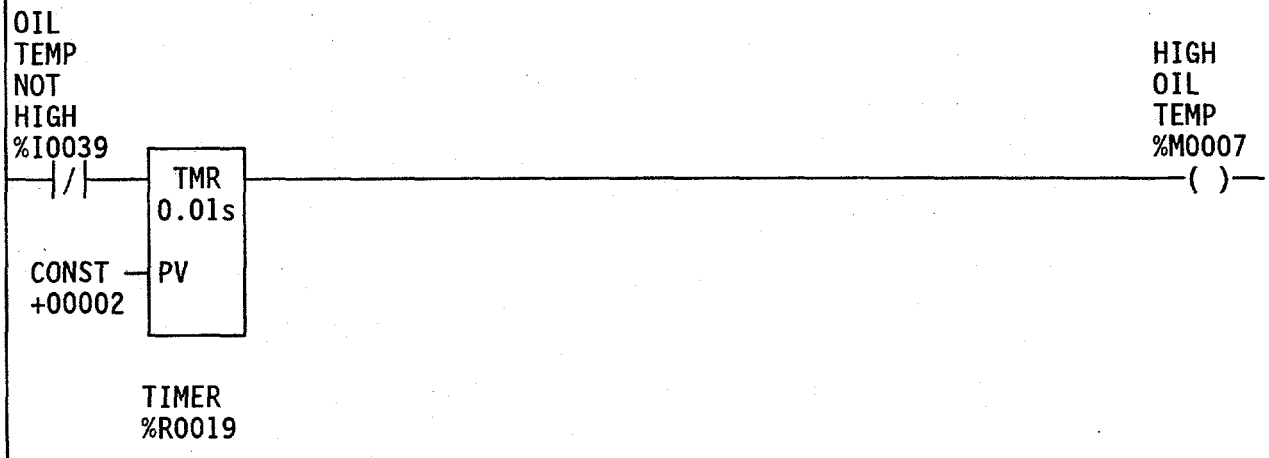
<< RUNG 9 STEP #0014 >>



<< RUNG 10 STEP #0017 >>

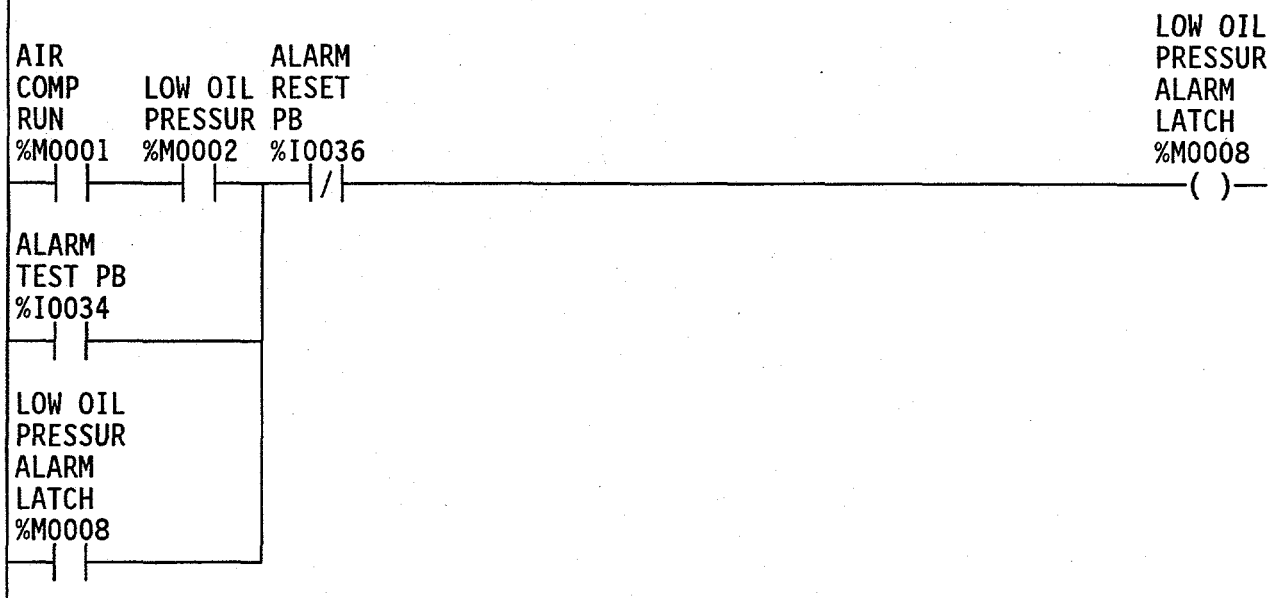


<< RUNG 11 STEP #0020 >>

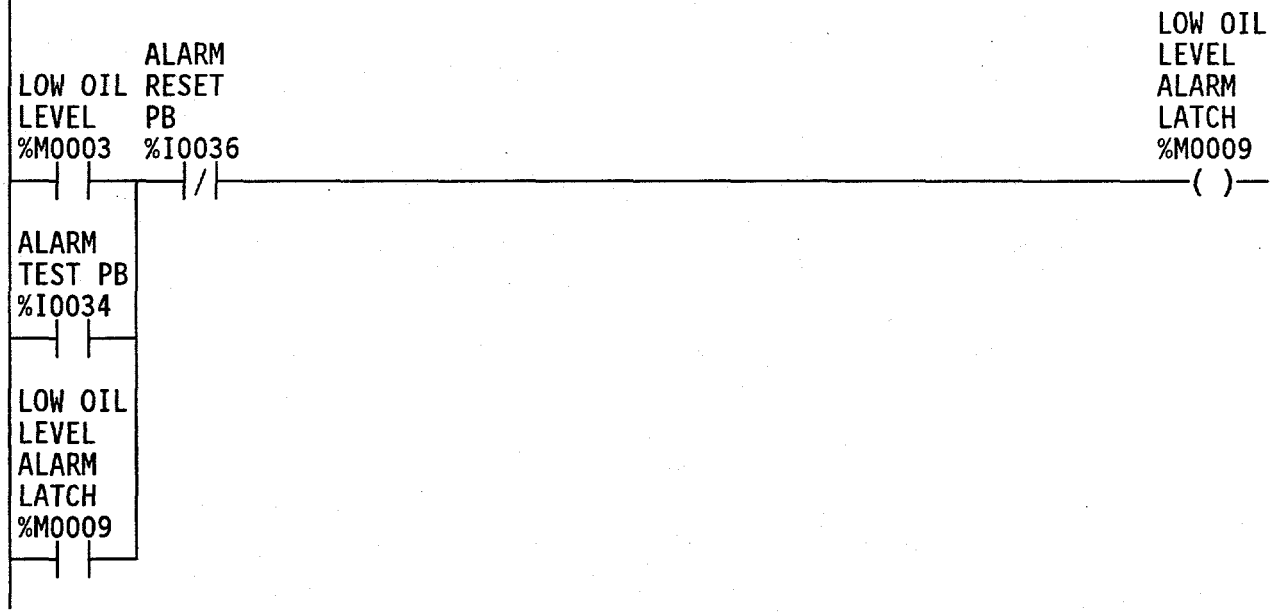


```
<< RUNG 12  STEP #0023 >>

NO                                                            VIBRATN
VIBRATN                                                       ALARM
%I0066                                                        %M0043
--|/|----[ TMR   ]-------------------------------------------( )--
          [ 0.10s ]
CONST ---[ PV    ]
+00002

         TIMER
         %R0037

<< RUNG 13  STEP #0026 >>

NO
ELECT                                                         ELECT
FAULT                                                         FAULT
%I0003                                                        %M0044
--|/|----[ TMR   ]-------------------------------------------( )--
          [ 0.10s ]
CONST ---[ PV    ]
+00002

         TIMER
         %R0040

<< RUNG 14  STEP #0029 >>

DISCHRG                                                       HIGH
TEMP                                                          DISCHRG
NOT                                                           AIR
HIGH                                                          TEMP
%I0068                                                        %M0045
--|/|----[ TMR   ]-------------------------------------------( )--
          [ 0.10s ]
CONST ---[ PV    ]
+00002

         TIMER
         %R0043

(**************************************************************************)
(* ALARM CONDITION OR ALARM TEST LATCH                                     *)
(**************************************************************************)
```

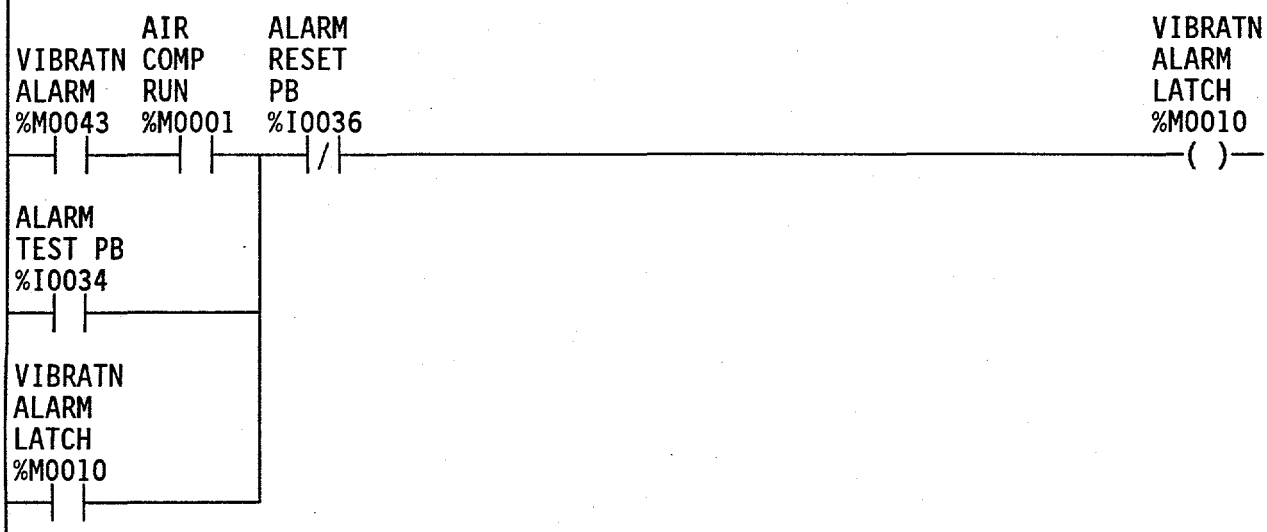
<< RUNG 16 STEP #0033 >>



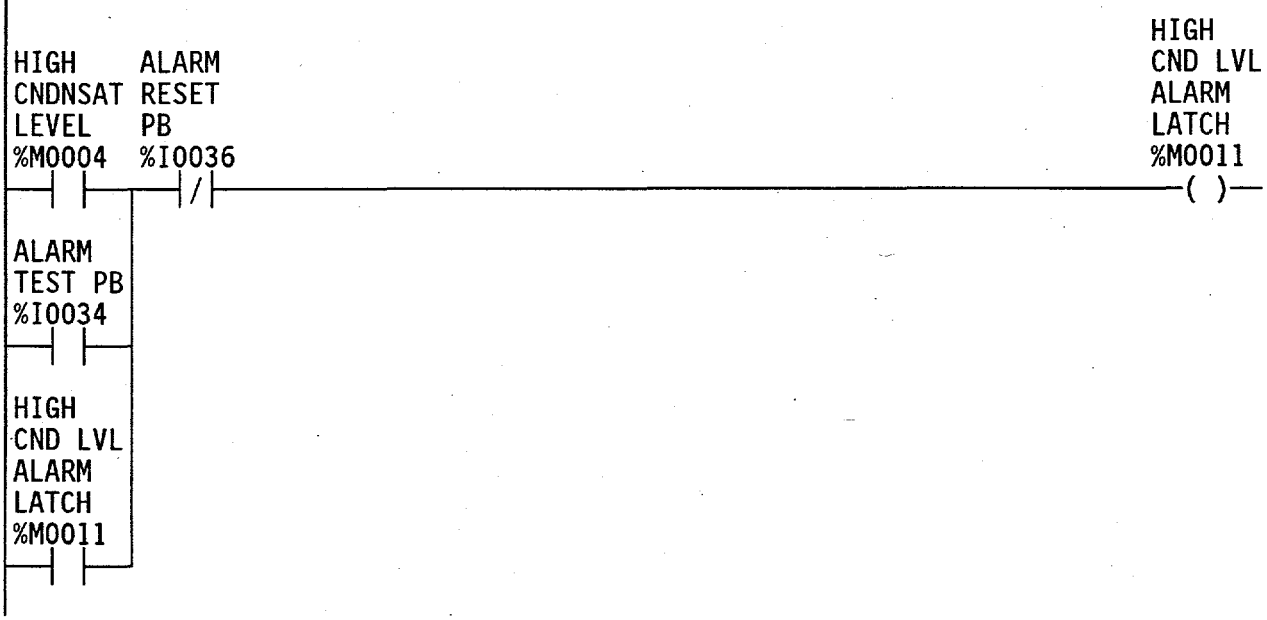
<< RUNG 17 STEP #0039 >>



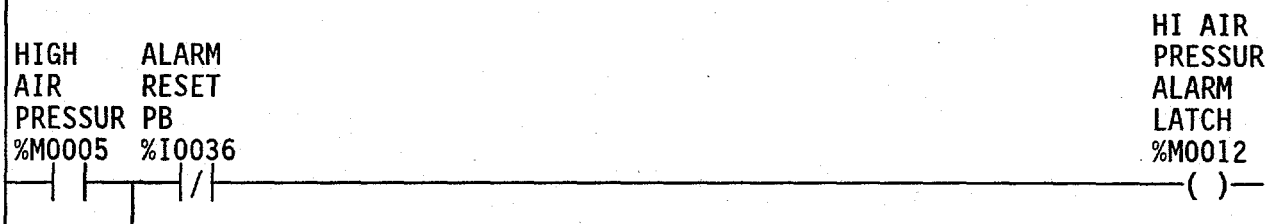
<< RUNG 18 STEP #0044 >>



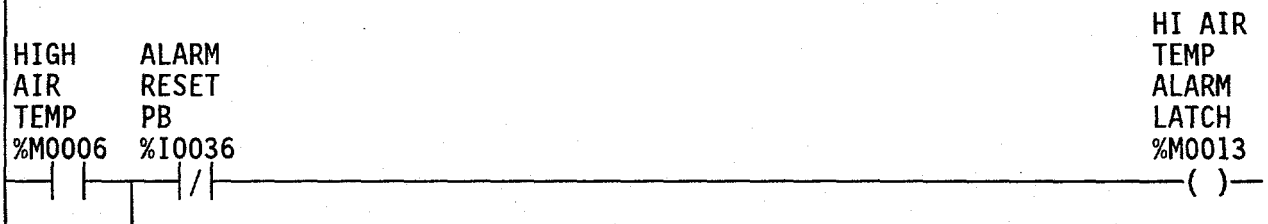
<< RUNG 19 STEP #0050 >>



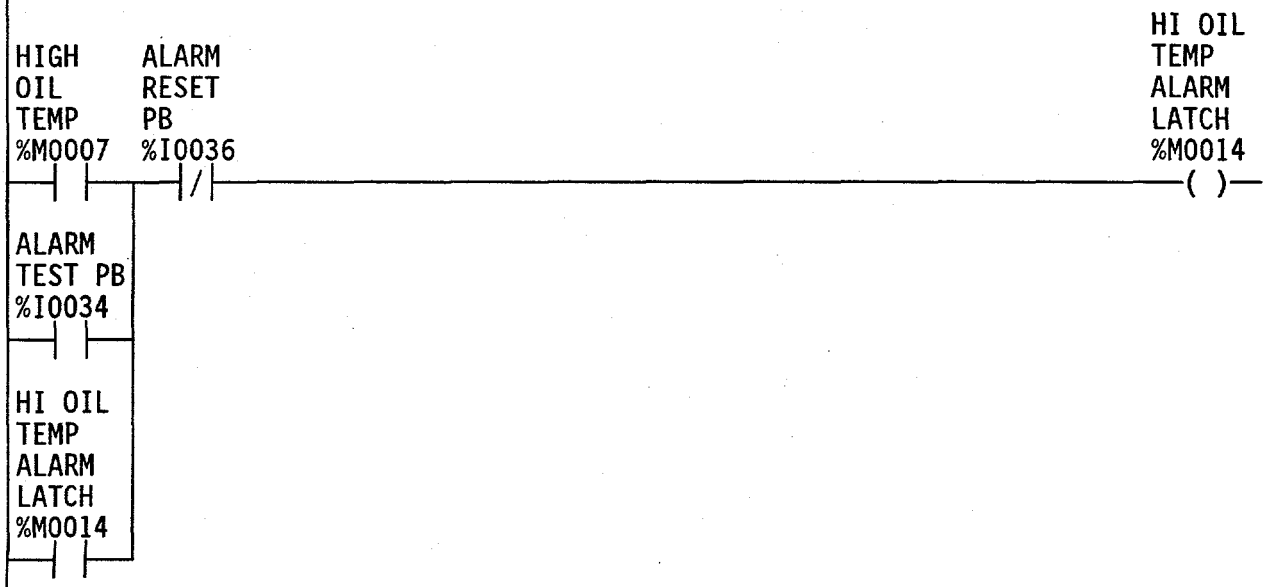
<< RUNG 20 STEP #0055 >>



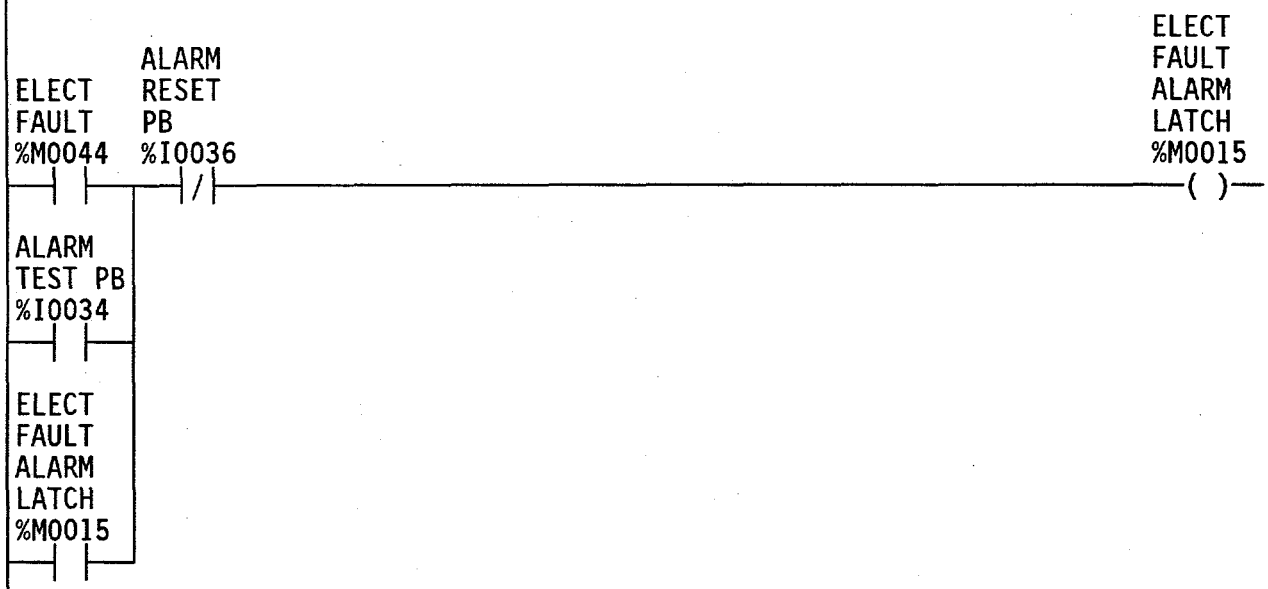
<< RUNG 21 STEP #0060 >>



<< RUNG 22 STEP #0065 >>



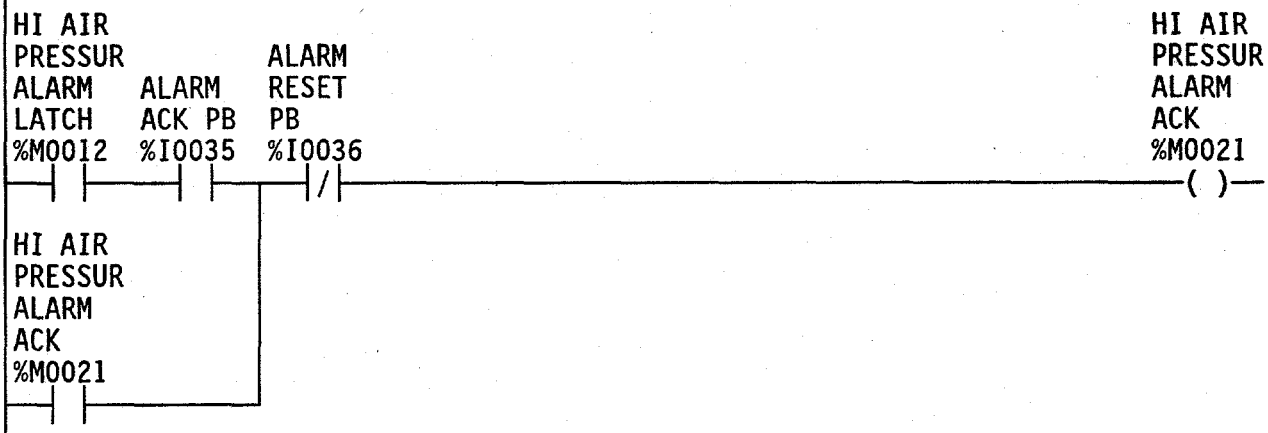
<< RUNG 23 STEP #0070 >>



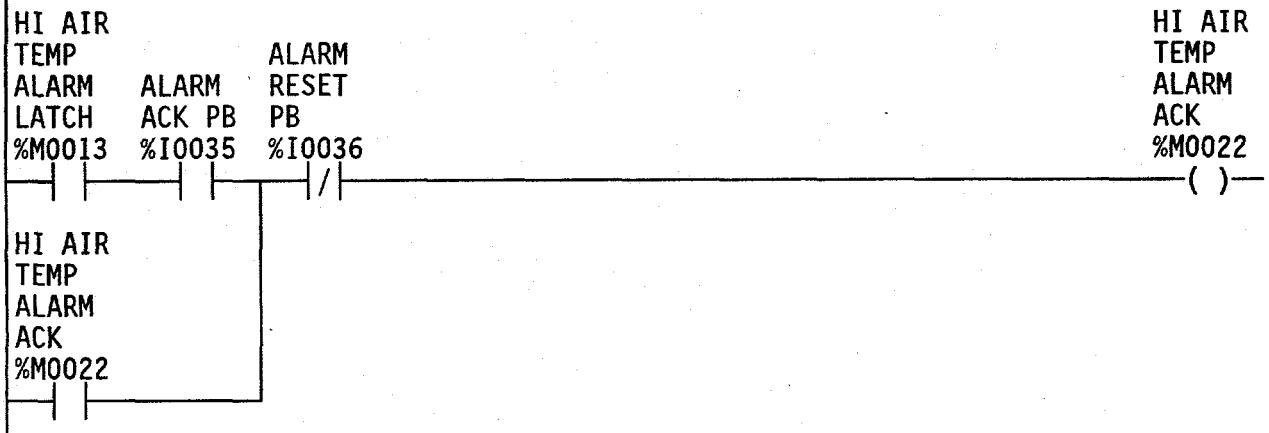
```
<< RUNG 24  STEP #0075 >>

HIGH                                                                    HI DISH
DISCHRG ALARM                                                           AIRTEMP
AIR     RESET                                                           ALARM
TEMP    PB                                                              LATCH
%M0045  %I0036                                                          %M0016
--| |---|/|-------------------------------------------------------------( )--

ALARM
TEST PB
%I0034
--| |--

HI DISH
AIRTEMP
ALARM
LATCH
%M0016
--| |--

 (*****************************************************************************)
 (* ALARM ACKNOWLEDGE                                                         *)
 (*****************************************************************************)

 << RUNG 26  STEP #0081 >>

LOW OIL                                                                 LOW OIL
PRESSUR         ALARM                                                   PRESSUR
ALARM   ALARM   RESET                                                   ALARM
LATCH   ACK PB  PB                                                      ACK
%M0008  %I0035  %I0036                                                  %M0017
--| |---| |---|/|-------------------------------------------------------( )--

LOW OIL
PRESSUR
ALARM
ACK
%M0017
--| |--
```

```
| << RUNG 27  STEP #0086 >>
|
|LOW OIL                                                                   LOW OIL
|LEVEL             ALARM                                                   LEVEL
|ALARM    ALARM    RESET                                                   ALARM
|LATCH    ACK PB   PB                                                      ACK
|%M0009   %I0035   %I0036                                                  %M0018
+--| |------| |---+--|/|---------------------------------------------------( )--
|                 |
|LOW OIL          |
|LEVEL            |
|ALARM            |
|ACK              |
|%M0018           |
+--| |------------+
|
| << RUNG 28  STEP #0091 >>
|
|VIBRATN           ALARM                                                   VIBRATN
|ALARM    ALARM    RESET                                                   ALARM
|LATCH    ACK PB   PB                                                      ACK
|%M0010   %I0035   %I0036                                                  %M0019
+--| |------| |---+--|/|---------------------------------------------------( )--
|                 |
|VIBRATN          |
|ALARM            |
|ACK              |
|%M0019           |
+--| |------------+
|
| << RUNG 29  STEP #0096 >>
|
|HIGH                                                                      HIGH
|CND LVL           ALARM                                                   CND LVL
|ALARM    ALARM    RESET                                                   ALARM
|LATCH    ACK PB   PB                                                      ACK
|%M0011   %I0035   %I0036                                                  %M0020
+--| |------| |---+--|/|---------------------------------------------------( )--
|                 |
|HIGH             |
|CND LVL          |
|ALARM            |
|ACK              |
|%M0020           |
+--| |------------+
|
```

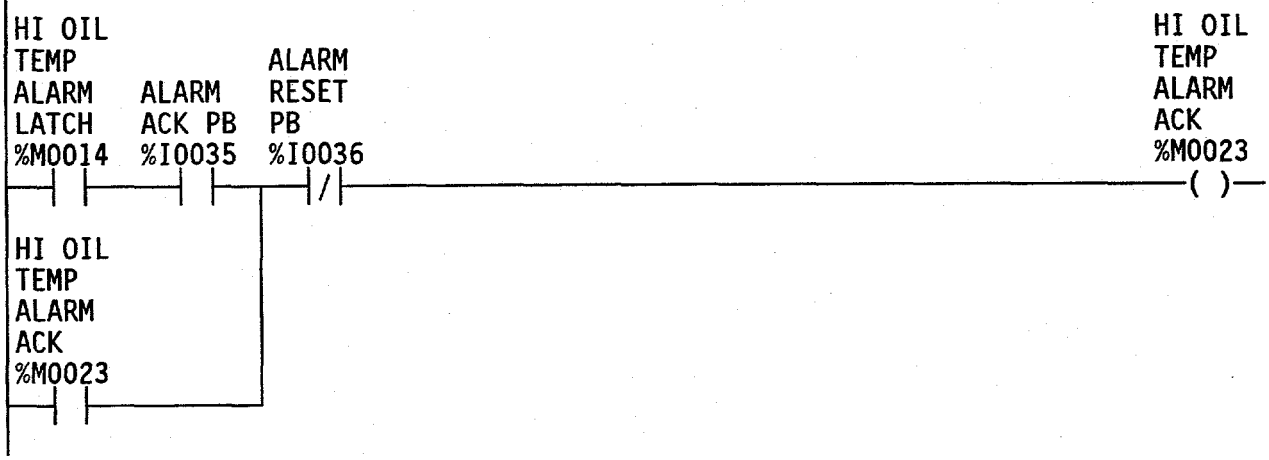
<< RUNG 30 STEP #0101 >>



<< RUNG 31 STEP #0106 >>



<< RUNG 32 STEP #0111 >>



```
 << RUNG 33  STEP #0116 >>

ELECT                                                         ELECT
FAULT            ALARM                                        FAULT
ALARM   ALARM    RESET                                        ALARM
LATCH   ACK PB   PB                                           ACK
%M0015  %I0035   %I0036                                       %M0024
--| |-----| |--+--|/|------------------------------------------( )--
               |
ELECT          |
FAULT          |
ALARM          |
ACK            |
%M0024         |
--| |----------+

 << RUNG 34  STEP #0121 >>

HI DISH                                                       HI DISH
AIRTEMP          ALARM                                        AIRTEMP
ALARM   ALARM    RESET                                        ALARM
LATCH   ACK PB   PB                                           ACK
%M0016  %I0035   %I0036                                       %M0025
--| |-----| |--+--|/|------------------------------------------( )--
               |
HI DISH        |
AIRTEMP        |
ALARM          |
ACK            |
%M0025         |
--| |----------+

 (***********************************************************************)
 (* ALARM FLASHER                                                       *)
 (***********************************************************************)

 << RUNG 36  STEP #0127 >>

ALARM                                                         ALARM
FLASH                                                         FLASH
OFF                                                           ON
%M0027   +-----+                                              %M0026
--|/|----| TMR |-----------------------------------------------( )--
         |0.10s|
         |     |
 CONST --| PV  |
 +00002  |     |
         +-----+

        TIMER
        %R0022
```

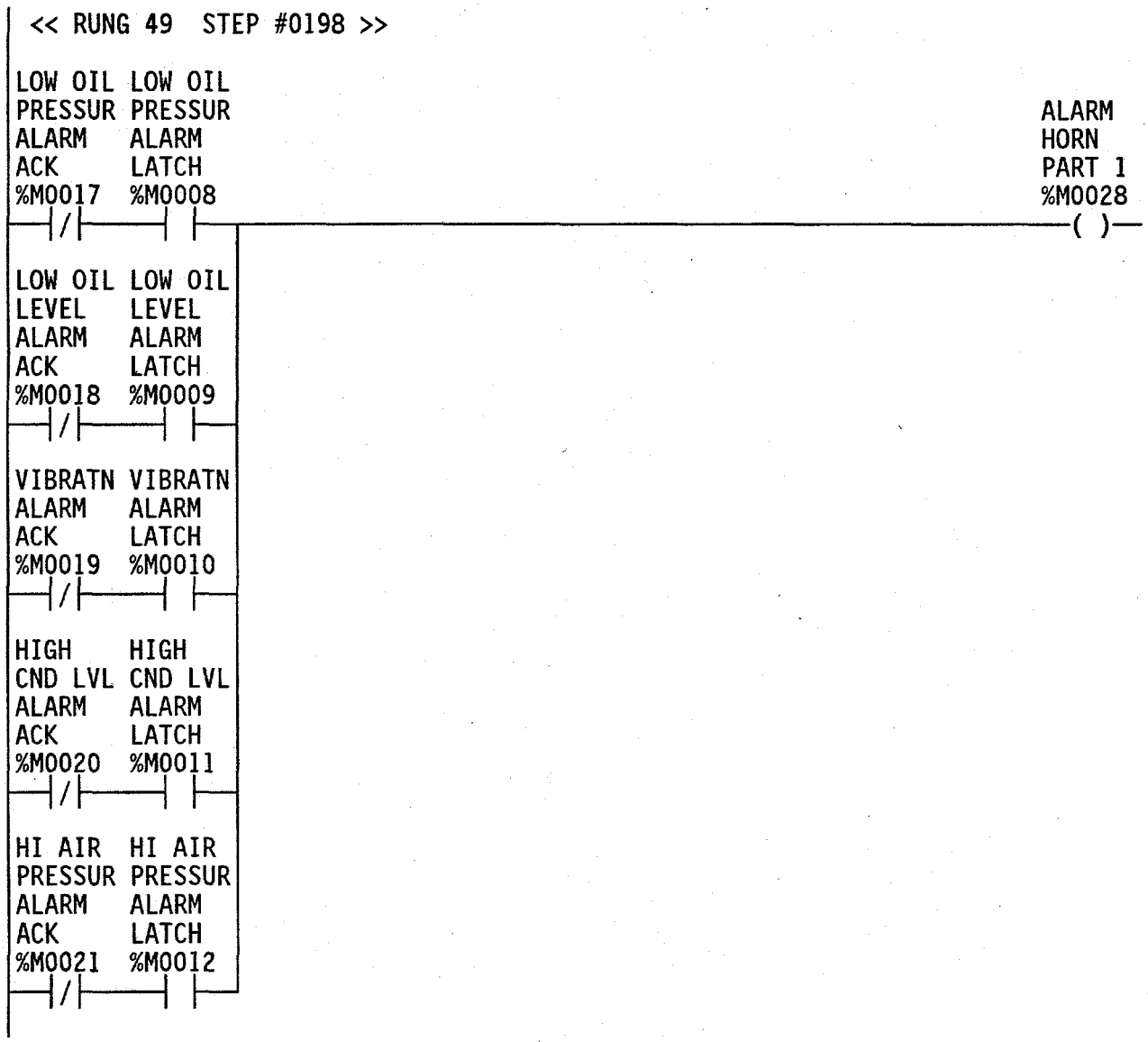
```
|<< RUNG 37  STEP #0130 >>
|
|ALARM                                                                     ALARM
|FLASH                                                                     FLASH
|ON                                                                        OFF
|%M0026  +-----+                                                           %M0027
+--| |---+ TMR +-----------------------------------------------------------( )--
|        |0.10s|
|        |     |
| CONST -+PV   |
| +00002 |     |
|        +-----+
|
|       TIMER
|       %R0025
|
| (**************************************************************************)
| (* ALARM LIGHTS                                                           *)
| (**************************************************************************)
|
| << RUNG 39  STEP #0134 >>
|
|LOW OIL LOW OIL
|PRESSUR PRESSUR
|ALARM   ALARM                                                             ALARM
|ACK     LATCH                                                             LIGHT
|%M0017  %M0008                                                            %Q0165
+--| |-----| |-----------+-------------------------------------------------( )--
|                        |
|LOW OIL LOW OIL         |
|PRESSUR PRESSUR ALARM   |
|ALARM   ALARM   FLASH   |
|ACK     LATCH   ON      |
|%M0017  %M0008  %M0026  |
+--|/|-----| |-----| |---+
|
| << RUNG 40  STEP #0141 >>
|
|LOW OIL LOW OIL
|LEVEL   LEVEL
|ALARM   ALARM                                                             ALARM
|ACK     LATCH                                                             LIGHT
|%M0018  %M0009                                                            %Q0166
+--| |-----| |-----------+-------------------------------------------------( )--
|                        |
|LOW OIL LOW OIL         |
|LEVEL   LEVEL   ALARM   |
|ALARM   ALARM   FLASH   |
|ACK     LATCH   ON      |
|%M0018  %M0009  %M0026  |
+--|/|-----| |-----| |---+
|
```

```
|<< RUNG 41  STEP #0148 >>
|
|VIBRATN VIBRATN
|ALARM   ALARM                                                             ALARM
|ACK     LATCH                                                             LIGHT
|%M0019  %M0010                                                            %Q0195
|--| |-----| |--+------------------------------------------------------------( )--
|               |
|VIBRATN VIBRATN ALARM
|ALARM   ALARM   FLASH
|ACK     LATCH   ON
|%M0019  %M0010  %M0026
|--|/|-----| |-----| |--+
|
|<< RUNG 42  STEP #0155 >>
|
|HIGH    HIGH
|CND LVL CND LVL
|ALARM   ALARM                                                             ALARM
|ACK     LATCH                                                             LIGHT
|%M0020  %M0011                                                            %Q0194
|--| |-----| |--+------------------------------------------------------------( )--
|               |
|HIGH    HIGH
|CND LVL CND LVL ALARM
|ALARM   ALARM   FLASH
|ACK     LATCH   ON
|%M0020  %M0011  %M0026
|--|/|-----| |-----| |--+
|
|<< RUNG 43  STEP #0162 >>
|
|HI AIR  HI AIR
|PRESSUR PRESSUR
|ALARM   ALARM                                                             ALARM
|ACK     LATCH                                                             LIGHT
|%M0021  %M0012                                                            %Q0196
|--| |-----| |--+------------------------------------------------------------( )--
|               |
|HI AIR  HI AIR
|PRESSUR PRESSUR ALARM
|ALARM   ALARM   FLASH
|ACK     LATCH   ON
|%M0021  %M0012  %M0026
|--|/|-----| |-----| |--+
|
```

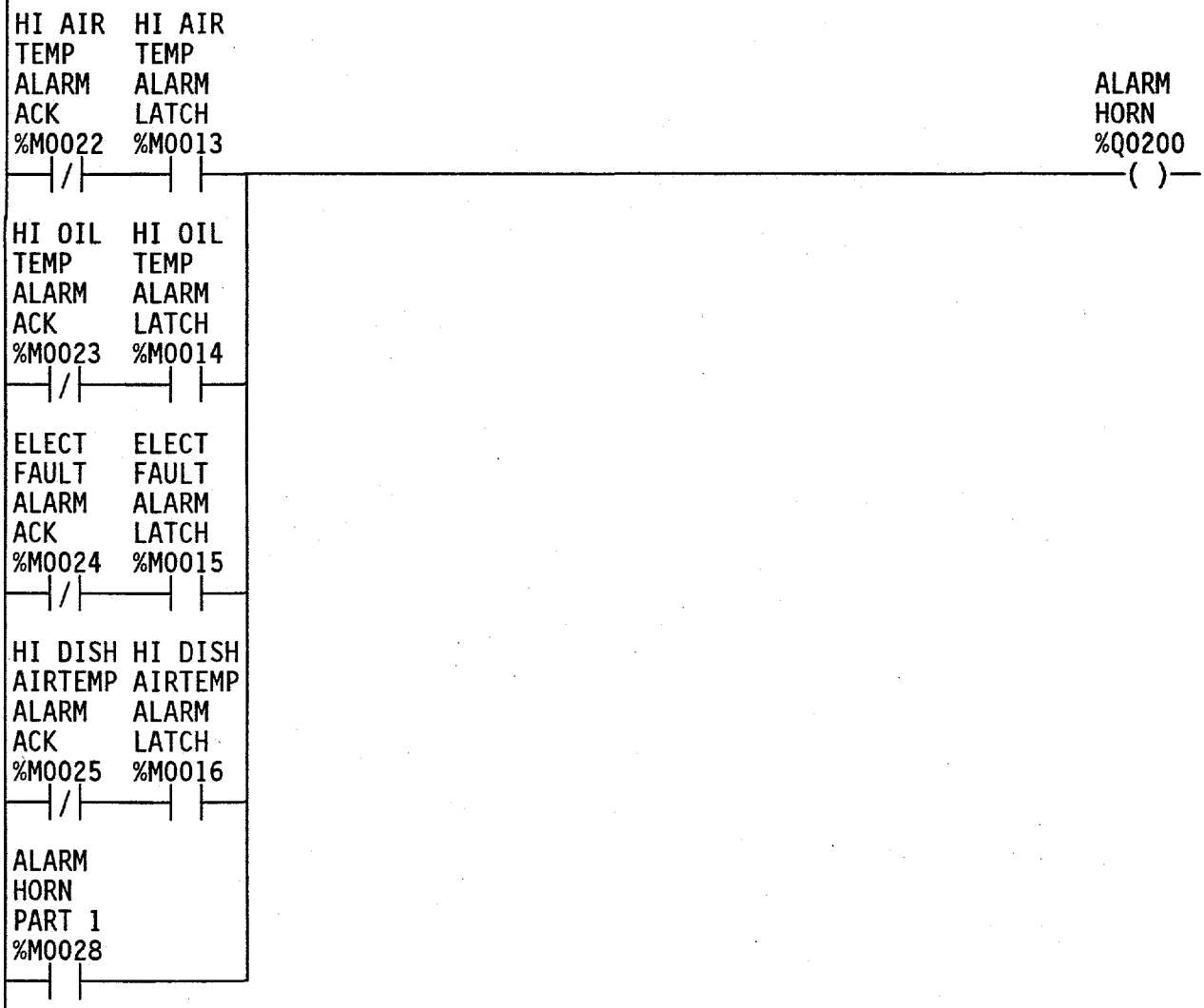
```
 << RUNG 44  STEP #0169 >>

HI AIR  HI AIR
TEMP    TEMP
ALARM   ALARM                                                    ALARM
ACK     LATCH                                                    LIGHT
%M0022  %M0013                                                   %Q0193
--| |---| |-------------------------------------------------------( )--

HI AIR  HI AIR
TEMP    TEMP    ALARM
ALARM   ALARM   FLASH
ACK     LATCH   ON
%M0022  %M0013  %M0026
--|/|---| |---| |--

 << RUNG 45  STEP #0176 >>

HI OIL  HI OIL
TEMP    TEMP
ALARM   ALARM                                                    ALARM
ACK     LATCH                                                    LIGHT
%M0023  %M0014                                                   %Q0167
--| |---| |-------------------------------------------------------( )--

HI OIL  HI OIL
TEMP    TEMP    ALARM
ALARM   ALARM   FLASH
ACK     LATCH   ON
%M0023  %M0014  %M0026
--|/|---| |---| |--

 << RUNG 46  STEP #0183 >>

ELECT   ELECT
FAULT   FAULT
ALARM   ALARM                                                    ALARM
ACK     LATCH                                                    LIGHT
%M0024  %M0015                                                   %Q0198
--| |---| |-------------------------------------------------------( )--

ELECT   ELECT
FAULT   FAULT   ALARM
ALARM   ALARM   FLASH
ACK     LATCH   ON
%M0024  %M0015  %M0026
--|/|---| |---| |--
```

```
<< RUNG 47  STEP #0190 >>

HI DISH HI DISH
AIRTEMP AIRTEMP
ALARM   ALARM                                                    ALARM
ACK     LATCH                                                    LIGHT
%M0025  %M0016                                                   %Q0197
─┤ ├────┤ ├──────────────────────────────────────────────────────( )─
 │
 │ HI DISH HI DISH
 │ AIRTEMP AIRTEMP ALARM
 │ ALARM   ALARM   FLASH
 │ ACK     LATCH   ON
 │ %M0025  %M0016  %M0026
 └─┤/├────┤ ├────┤ ├─

 (*************************************************************************)
 (* ALARM HORN                                                            *)
 (*************************************************************************)
```

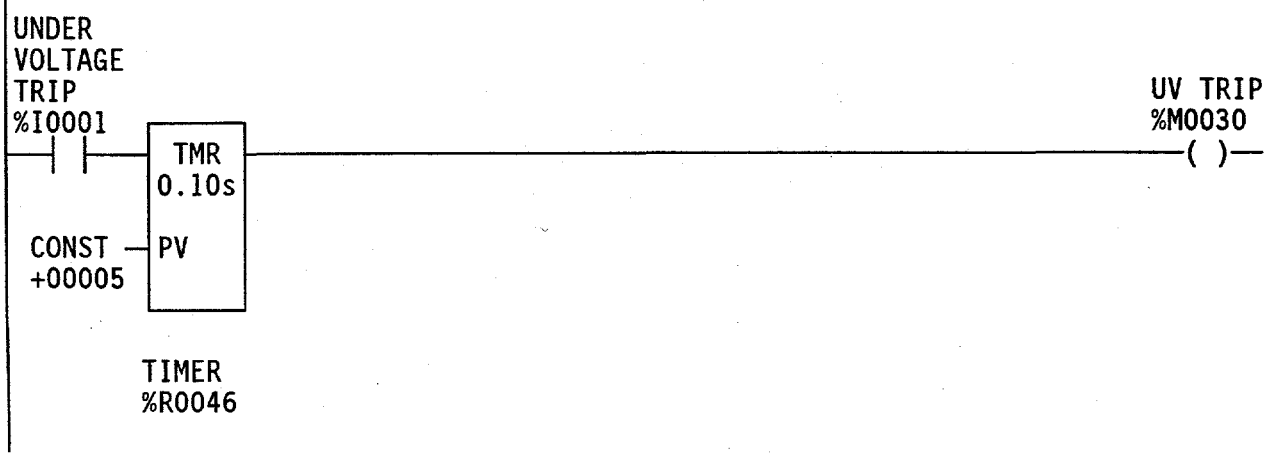
<< RUNG 49 STEP #0198 >>

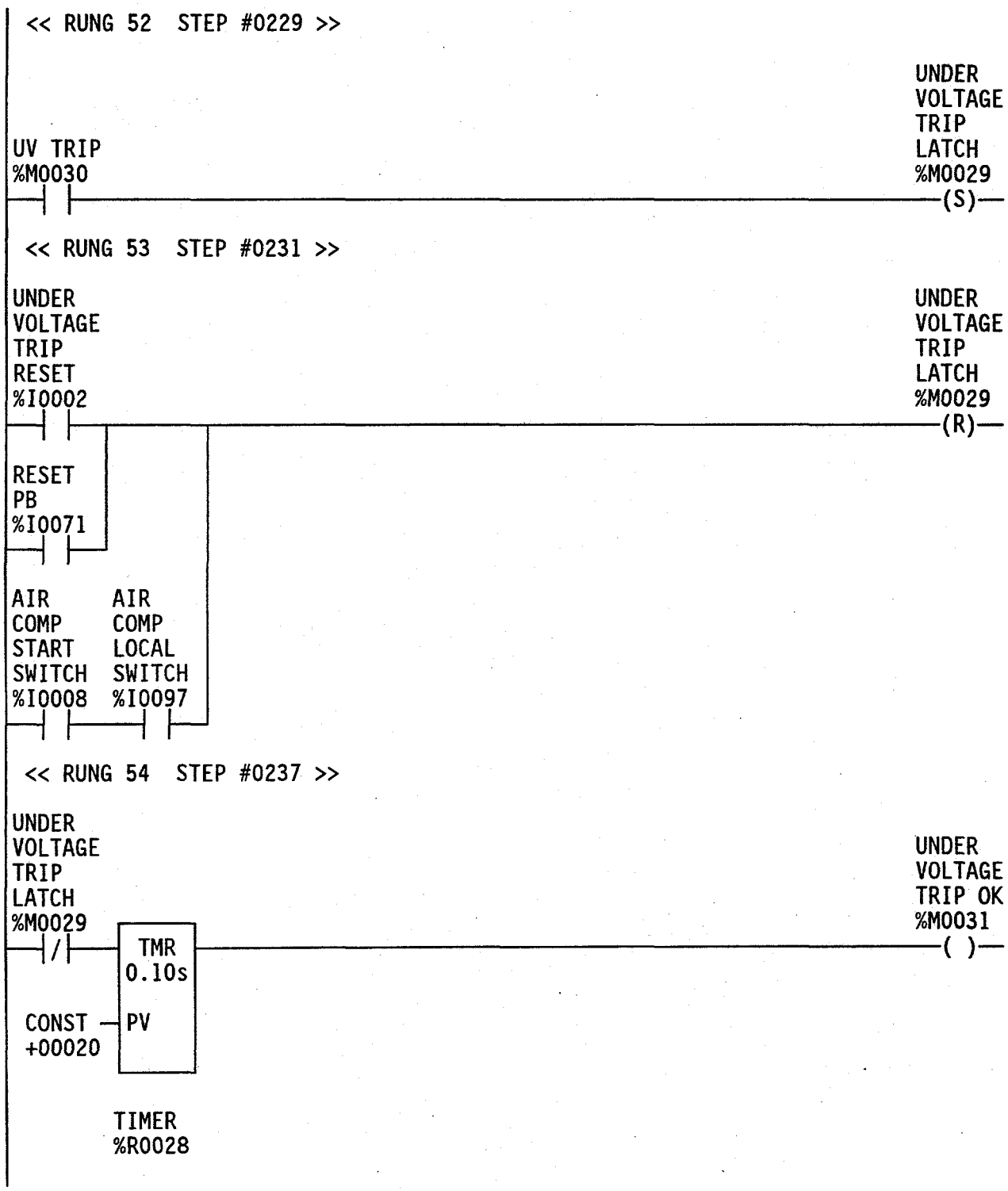


<< RUNG 50 STEP #0213 >>

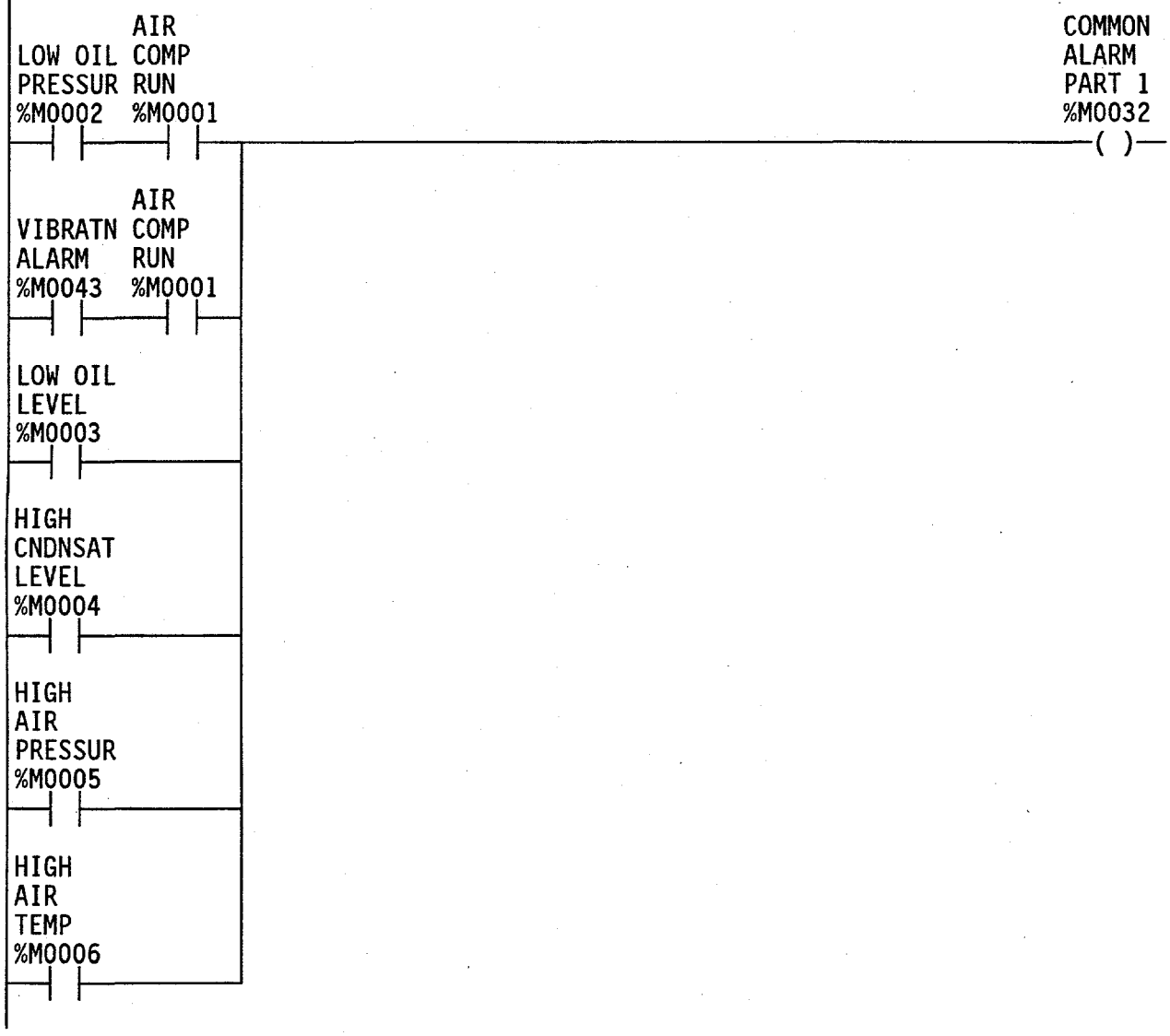


<< RUNG 51 STEP #0226 >>



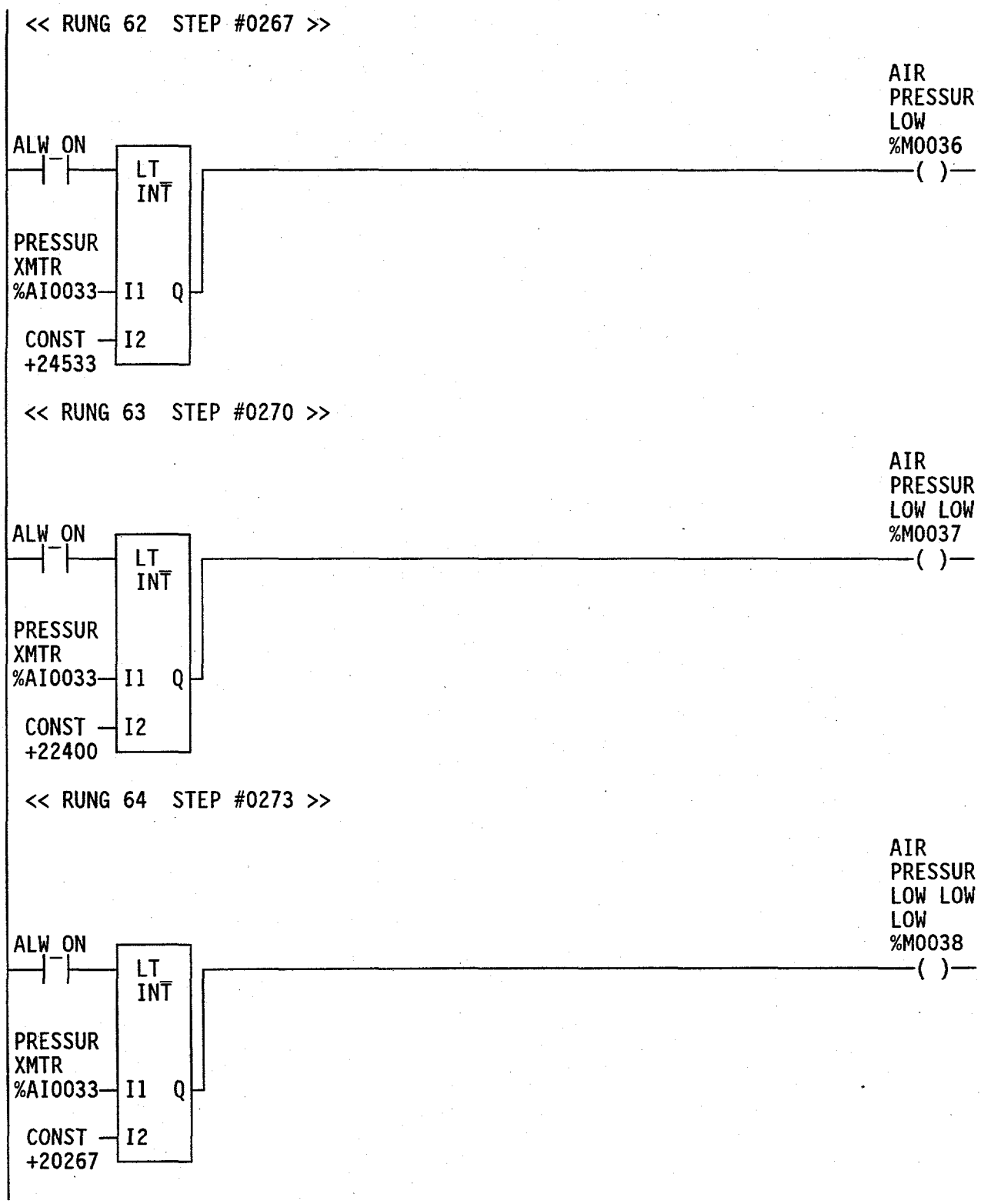

<< RUNG 52 STEP #0229 >>
UV TRIP
%M0030
UNDER VOLTAGE TRIP LATCH
%M0029
(S)
<< RUNG 53 STEP #0231 >>
UNDER VOLTAGE TRIP RESET
%I0002
UNDER VOLTAGE TRIP LATCH
%M0029
(R)
RESET PB
%I0071
AIR COMP START SWITCH
%I0008
AIR COMP LOCAL SWITCH
%I0097
<< RUNG 54 STEP #0237 >>
UNDER VOLTAGE TRIP LATCH
%M0029
TMR
0.10s
CONST
+00020
PV
TIMER
%R0028
UNDER VOLTAGE TRIP OK
%M0031
( )

<< RUNG 55 STEP #0240 >>



```
|  << RUNG 56  STEP #0250 >>
|
|HIGH
|OIL                                                                  COMMON
|TEMP                                                                 ALARM
|%M0007                                                               %M0033
+--] [---+------------------------------------------------------------( )--
|        |
|ELECT   |
|FAULT   |
|%M0044  |
+--] [---+
|        |
|HIGH    |
|DISCHRG |
|AIR     |
|TEMP    |
|%M0045  |
+--] [---+
|        |
|COMMON  |
|ALARM   |
|PART 1  |
|%M0032  |
+--] [---+
|
|  (***************************************************************************)
|  (* COMMON ALARM FOR RETRANSMISSION/REFLASH                                  *)
|  (***************************************************************************)
|
|  << RUNG 58  STEP #0256 >>
|
|                                                                     COMMON
|COMMON                                                               ALARM
|ALARM                                                                LATCH
|%M0033                                                               %M0034
+--] [-----------------------------------------------------------------(S)--
|
```

```
| << RUNG 59  STEP #0258 >>
|
|UNDER
|VOLTAGE UNDER                                                         COMMON
|TRIP    VOLTAGE                                                       ALARM
|LATCH   TRIP OK                                                       LATCH
|%M0029  %M0031                                                        %M0034
|--|/|-----|/|--+-------------------------------------------------------(R)--
|               |
|SHUTDWN        |
|RESET          |
|PB             |
|%I0033         |
|--| |----------+
|               |
|RESET          |
|PB             |
|%I0071         |
|--| |----------+
|
| (************************************************************************)
| (* COMPARE SIGNAL FROM PRESSURE TRANSMITTER TO SETPOINTS                *)
| (* NOTE: 27.3 COUNTS PER PSI                                            *)
| (************************************************************************)
|
| << RUNG 61  STEP #0264 >>
|
|                                                                      AIR
|                                                                      PRESSUR
|                                                                      HIGH
|ALW_ON      +-----+                                                   %M0035
|--| |-------| GT_ |+--------------------------------------------------( )--
|            | INT ||
|            |     ||
|PRESSUR     |     ||
|XMTR        |     ||
|%AI0033-----|I1  Q|+
|            |     |
|  CONST ----|I2   |
|  +26667    +-----+
|
```

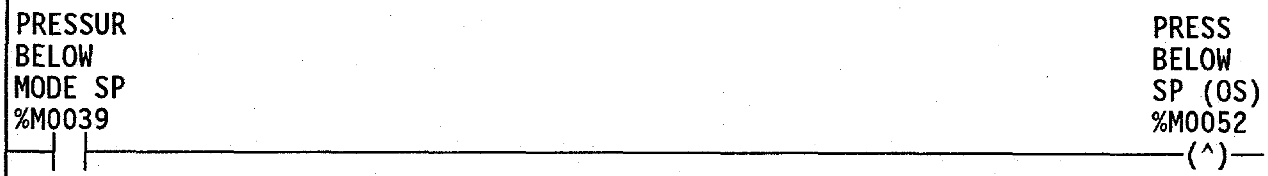

<< RUNG 62 STEP #0267 >>
ALW_ON
LT INT
PRESSUR XMTR %AI0033
I1
Q
CONST +24533
I2
AIR PRESSUR LOW %M0036
<< RUNG 63 STEP #0270 >>
ALW_ON
LT INT
PRESSUR XMTR %AI0033
I1
Q
CONST +22400
I2
AIR PRESSUR LOW LOW %M0037
<< RUNG 64 STEP #0273 >>
ALW_ON
LT INT
PRESSUR XMTR %AI0033
I1
Q
CONST +20267
I2
AIR PRESSUR LOW LOW LOW %M0038

```
 << RUNG 65  STEP #0276 >>

MODE    AIR                                                      PRESSUR
TWO     PRESSUR                                                  BELOW
SELECTD LOW LOW                                                  MODE SP
%I0005  %M0037                                                   %M0039
--| |-----| |---+-------+-------------------------------------------( )--
                |       |
        AIR     |       |
MODE    PRESSUR |       |
THREE   LOW LOW |       |
SELECTD LOW     |       |
%I0006  %M0038  |       |
--| |-----| |---+       |
                        |
MODE    MODE    AIR     |
TWO     THREE   PRESSUR |
SELECTD SELECTD LOW     |
%I0005  %I0006  %M0036  |
--|/|-----|/|-----| |---+

 (***********************************************************************)
 (* COMPRESSOR RUNNING LIGHTS                                           *)
 (***********************************************************************)

 << RUNG 67  STEP #0287 >>

AIR
COMP
RUN                                                              COMP
COIL                                                             RUNNING
%Q0161                                                           %Q0225
--| |---------------------------------------------------------------( )--

 (***********************************************************************)
 (* POWER AVAILABLE LIGHTS                                              *)
 (***********************************************************************)

 << RUNG 69  STEP #0290 >>

AIR
COMP                                                             COMP
RUN                                                              NOT
COIL                                                             RUNNING
%Q0161                                                           %Q0226
--|/|---------------------------------------------------------------( )--

 (***********************************************************************)
 (* THE FOLLOWING RUNG WAS ADDED TO ENERGIZE THE VIBRATION SWITCH RESET *)
 (* COIL.  4/28/94  KEW                                                 *)
 (***********************************************************************)
```

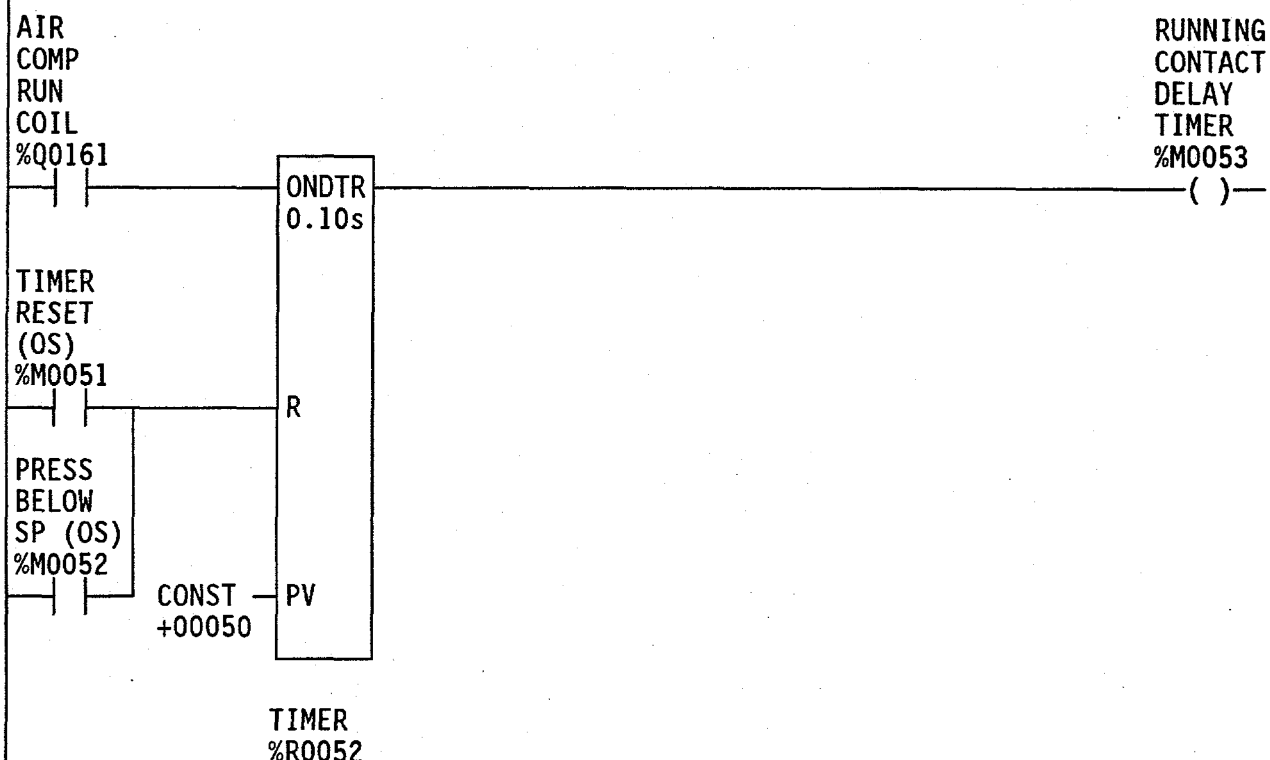
```
| << RUNG 71  STEP #0293 >>
|
|AIR                                                                        VIB.
|COMP    AIR                                                                SWITCH
|RUN     COMP                                                               RESET
|COIL    RUN                                                                COIL
|%Q0161  %M0001                                                             %Q0227
|--| |-----|/|-------------------------------------------------------------( )--
|
| (***************************************************************************)
| (* 20 SECONDS AFTER COMPRESSOR STOPS, ENERGIZE SOLENOID TO ISOLATE COOLING *)
| (* WATER                                                                   *)
| (***************************************************************************)
|
| << RUNG 73  STEP #0297 >>
|
|AIR
|COMP                                                                       COMPRSR
|RUN                                                                        OFF
|COIL                                                                       DELAY
|%Q0161  +-----+                                                            %M0041
|--|/|---| TMR |------------------------------------------------------------( )--
|        |0.10s|
|        |     |
| CONST -|PV   |
| +00200 |     |
|        +-----+
|
|       TIMER
|       %R0031
|
| << RUNG 74  STEP #0300 >>
|
|                                                                           STOP
|        COMPRSR                                                            COOLING
|ELECT   OFF                                                                WATER
|FAULT   DELAY                                                              FLOW
|%M0044  %M0041                                                             %Q0162
|--|/|-----| |-------------------------------------------------------------( )--
|
| (***************************************************************************)
| (* CONTROL LOADING OF COMPRESSOR                                           *)
| (***************************************************************************)
|
```

```
<< RUNG 76  STEP #0304 >>

PRESSUR AIR     AIR                                                  UNLOAD
BELOW   PRESSUR COMP                                                 SOLENOI
MODE SP HIGH    RUN                                                  D
%M0039  %M0035  %M0001                                               %Q0164
--| |---+--|/|------| |----------------------------------------------( )--
        |
UNLOAD  |
SOLENOI |
D       |
%Q0164  |
--| |---+

(***************************************************************************)
(* COIL TO INDICATE COMPRESSOR RUNNING UNLOADED FOR GREATER THAN 3 MINUTES *)
(***************************************************************************)

<< RUNG 78  STEP #0310 >>

AIR     UNLOAD                                                       RUNNING
COMP    SOLENOI                                                      UNLODED
RUNNING D                                                            TIMER
%I0004  %Q0164  +-----+                                              %M0042
--| |------|/|--| TMR |----------------------------------------------( )--
                |0.10s|
                |     |
        CONST --|PV   |
        +18000  |     |
                +-----+

                TIMER
                %R0034

<< RUNG 79  STEP #0314 >>

AIR
COMP                                                                 TIMER
START                                                                RESET
SWITCH                                                               (OS)
%I0008                                                               %M0051
--| |---+------------------------------------------------------------(^)--
        |
RESET   |
PB      |
%I0071  |
--| |---+
```

<< RUNG 80 STEP #0317 >>



<< RUNG 81 STEP #0319 >>



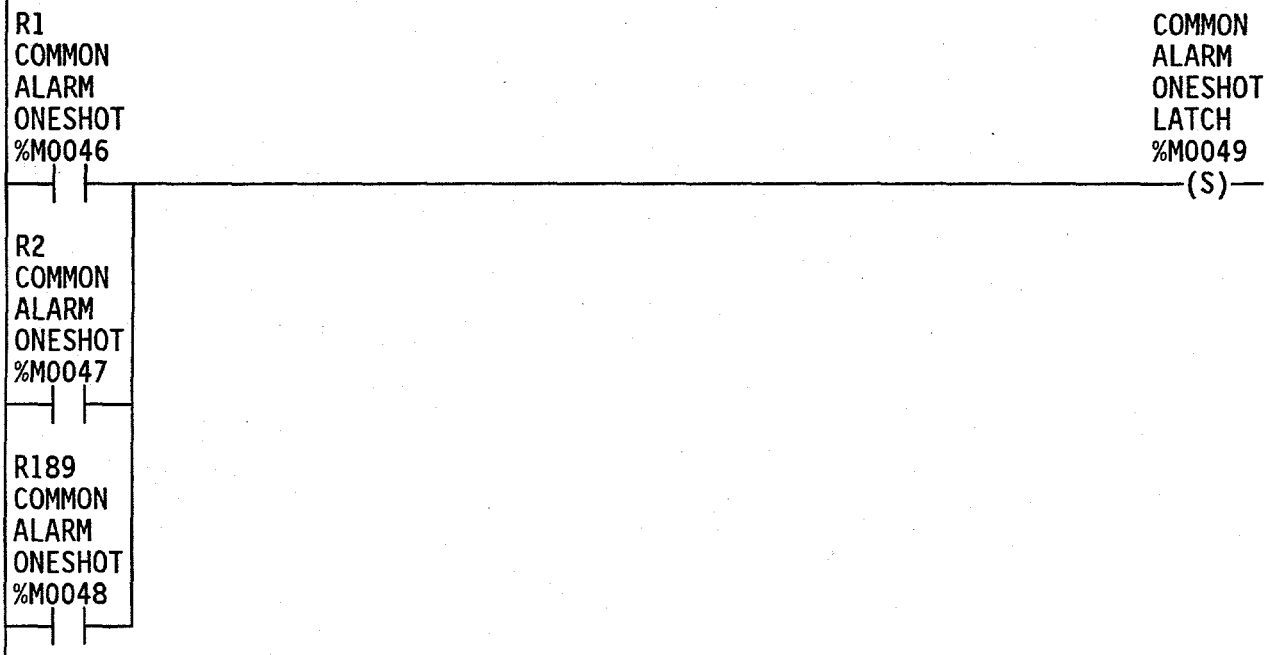
(***)
(* CONTROL AIR COMPRESSOR *)
(***)

```
 << RUNG 83  STEP #0325 >>

AIR     AIR               RUNNING                    UNDER                         AIR
COMP    COMP     PRESSUR  CONTACT  RUNNING  COMMON   VOLTAGE                       COMP
LOCAL   AUTO     BELOW    DELAY    UNLODED  ALARM    TRIP                          RUN
SWITCH  SWITCH   MODE SP  TIMER    TIMER    LATCH    LATCH                         COIL
%I0097  %I0007   %M0039   %M0053   %M0042   %M0034   %M0029                        %Q0161
--| |-----| |------| |------|/|------|/|------|/|------|/|--------------------------( )--
                 AIR
                 COMP
                 RUNNING
                 %I0004
                 --| |--

AIR     AIR
COMP    COMP
LOCAL   START
SWITCH  SWITCH
%I0097  %I0008
--| |-----| |--

C-187
CONTROL
SWITCH  RESET
LATCH   PB
%M0100  %I0071
--| |-----| |--

        AIR
        COMP
        RUNNING
        %I0004
        --| |--

 (*************************************************************************)
 (* SET/RESET FUNCTION ADDED TO PREVENT MOTOR STARTER DROP OUT WHEN       *)
 (* CONTROLLING COMPRESSOR FROM C-187.  12/20/94  KEW                     *)
 (*************************************************************************)

 << RUNG 85  STEP #0344 >>

AIR                                                                        C-187
COMP                                                                       CONTROL
LOCAL                                                                      SWITCH
SWITCH                                                                     LATCH
%I0097                                                                     %M0100
--| |----------------------------------------------------------------------(R)--
```

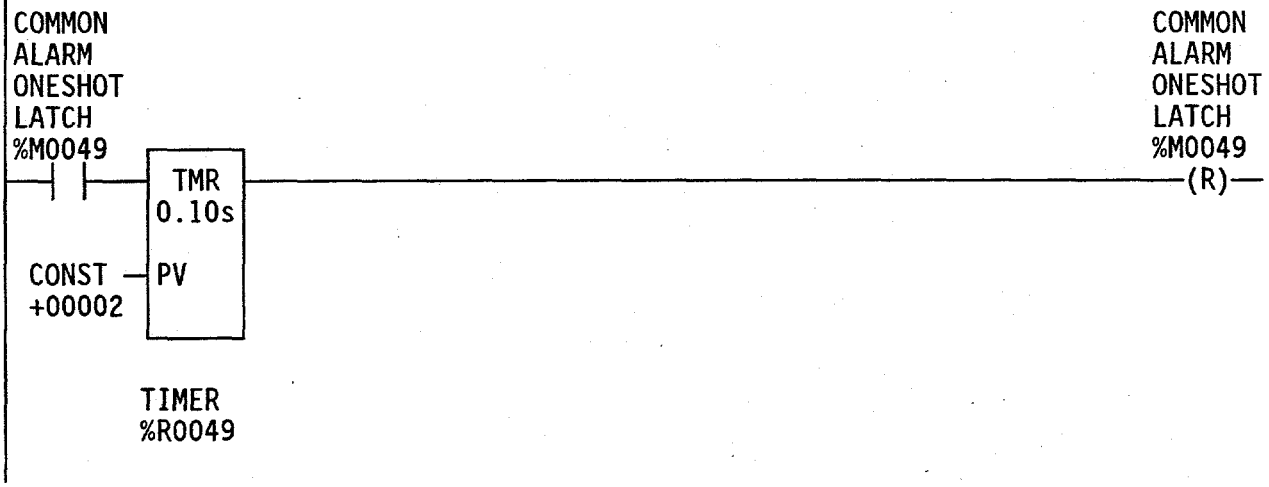
```
|  << RUNG 86  STEP #0346 >>
|
|AIR                                                                 C-187
|COMP                                                                CONTROL
|RUN                                                                 SWITCH
|SWITCH                                                              LATCH
|%I0072                                                              %M0100
|--| |----------------------------------------------------------------(S)--
|
|  (**************************************************************************)
|  (* AFTERCOOLER HIGH CONDENSATE LEVEL ALARM                                *)
|  (* (OFF = ALARM)                                                          *)
|  (**************************************************************************)
|
|  << RUNG 88  STEP #0349 >>
|
|AFTRCLR                                                             AFTRCLR
|CNDNSAT                                                             CNDNSAT
|LEVEL                                                               LEVEL
|NOT HI                                                              NOT HI
|%I0070                                                              %Q0261
|--| |----------------------------------------------------------------( )--
|
|  (**************************************************************************)
|  (* LOW LOW LOW PRESSURE ALARM                                             *)
|  (* (OFF = ALARM)                                                          *)
|  (**************************************************************************)
|
|  (**************************************************************************)
|  (* TIMER ADDED TO PREVENT CONTACT CHATTER. 10/19/94 KEW                   *)
|  (**************************************************************************)
|
|  << RUNG 91  STEP #0353 >>
|
|R1 NO   R2 NO   AIR                                                 PRESSUR
|LOW LOW LOW LOW PRESSUR                                             NOT LOW
|LOW     LOW     LOW LOW                                             LOW LOW
|PRESSUR PRESSUR LOW                                                 ALARM
|%I0100  %I0101  %M0038  +-----+                                     %Q0257
|--| |-----| |-----|/|---| TMR |-------------------------------------( )--
|                        |0.10s|
|                        |     |
|                CONST --|PV   |
|                +00050  |     |
|                        +-----+
|                        HPLSL
|                        ON DEL.
|                        TIMER
|                        REV. 1
|                        %R0055
|
```

```
(*****************************************************************************)
(* COMMON ALARM RETRANSMISSION/REFLASH                                       *)
(* (OFF = ALARM)                                                             *)
(*****************************************************************************)

 << RUNG 93  STEP #0359 >>

RI                                                                  R1
COMMON                                                              COMMON
ALARM                                                               ALARM
OFF                                                                 ONESHOT
%I0098                                                              %M0046
---|/|-------------------------------------------------------------(^)---

 << RUNG 94  STEP #0361 >>

R2                                                                  R2
COMMON                                                              COMMON
ALARM                                                               ALARM
OFF                                                                 ONESHOT
%I0099                                                              %M0047
---|/|-------------------------------------------------------------(^)---

 << RUNG 95  STEP #0363 >>

                                                                    R189
                                                                    COMMON
ALARM                                                               ALARM
LATCH                                                               ONESHOT
%M0055                                                              %M0048
---| |-------------------------------------------------------------(^)---
```

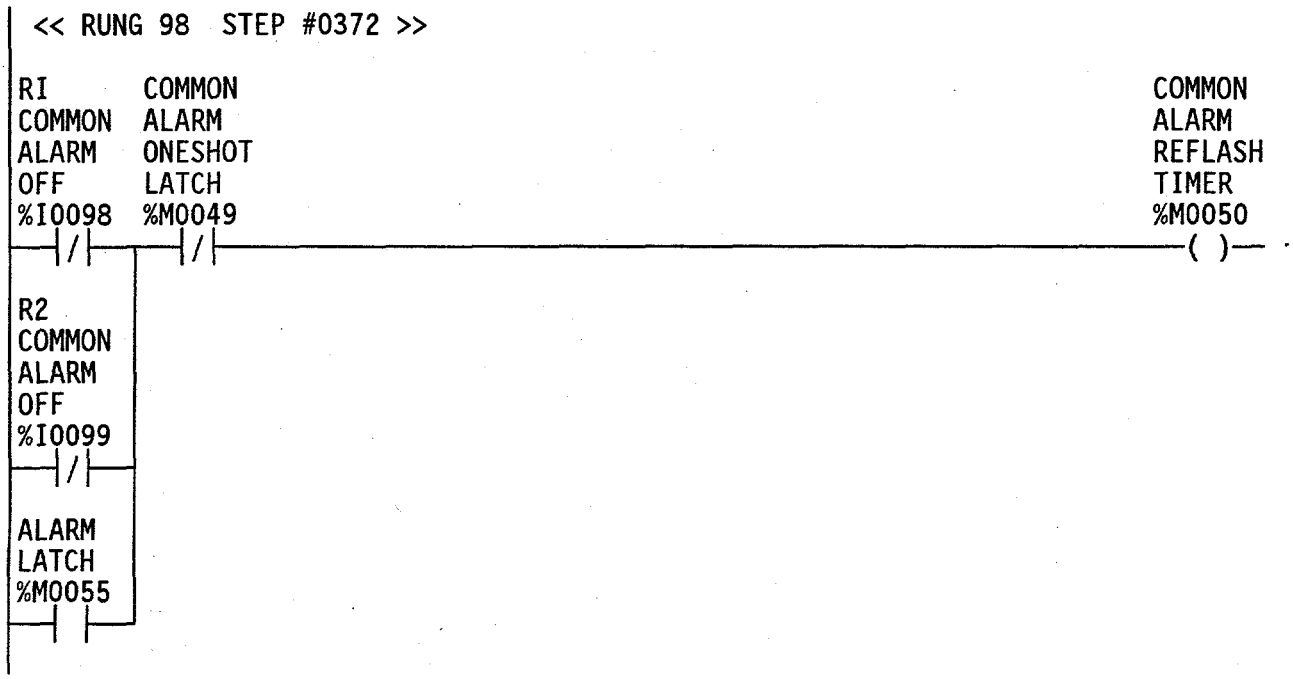
<< RUNG 96 STEP #0365 >>



<< RUNG 97 STEP #0369 >>

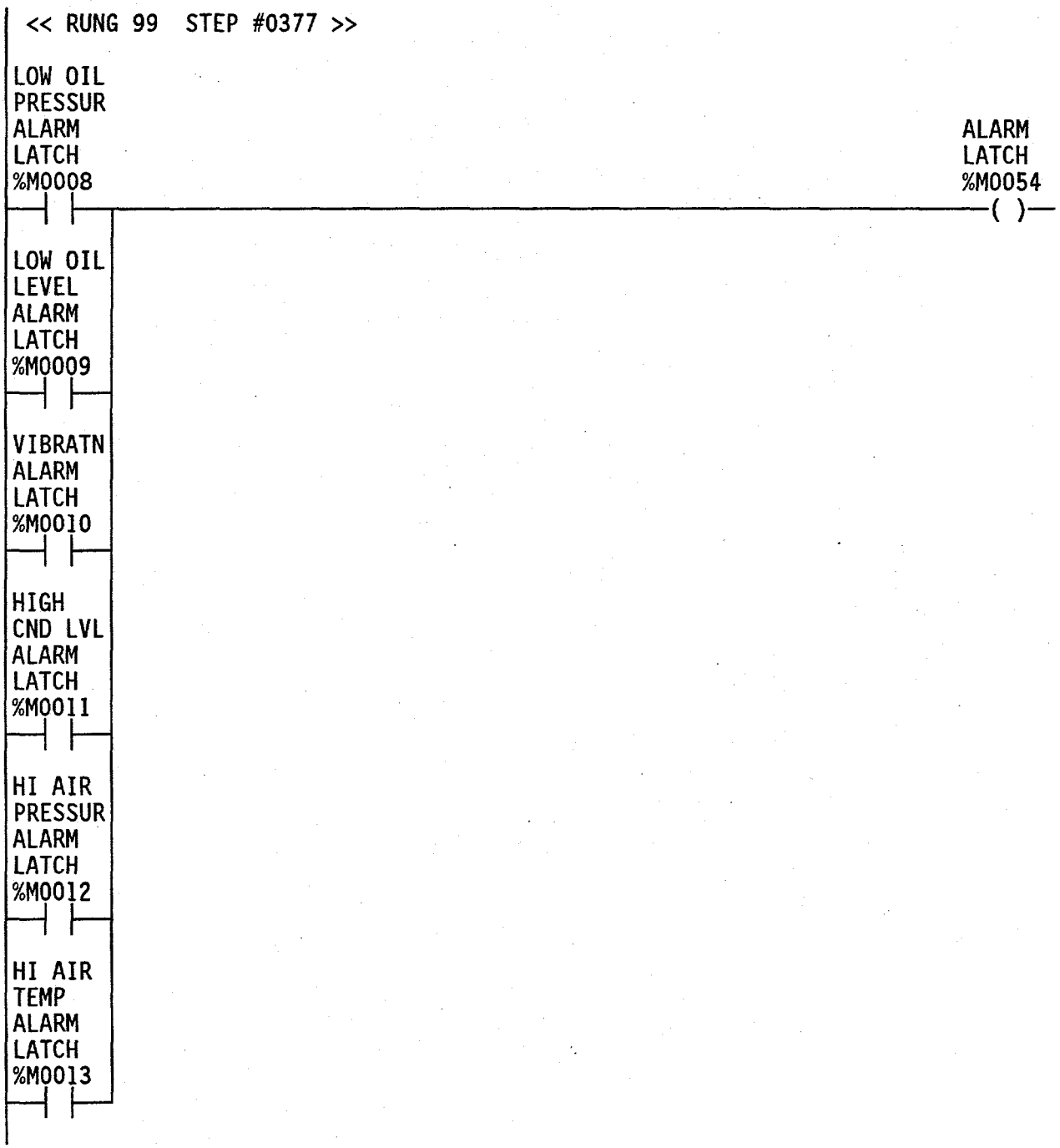


<< RUNG 98 STEP #0372 >>



FFTF AIR COMPRESSOR CONTROL LOGIC C-620C (R189)
REVISION 1 BY KEW 2/14/95 NOVA CONTRACT WST-XXV-002736

<< RUNG 99 STEP #0377 >>



```
| << RUNG 100  STEP #0384 >>
|
|HI OIL
|TEMP
|ALARM                                                              ALARM
|LATCH                                                              LATCH
|%M0014                                                             %M0055
+--| |--+-----------------------------------------------------------( )--
|       |
|ELECT  |
|FAULT  |
|ALARM  |
|LATCH  |
|%M0015 |
+--| |--+
|       |
|HI DISH|
|AIRTEMP|
|ALARM  |
|LATCH  |
|%M0016 |
+--| |--+
|       |
|ALARM  |
|LATCH  |
|%M0054 |
+--| |--+
|
| << RUNG 101  STEP #0389 >>
|
|COMMON
|ALARM                                                              NO
|REFLASH                                                            COMMON
|TIMER                                                              ALARM
|%M0050                                                             %Q0258
+--|/|--------------------------------------------------------------( )--
|
|[      END OF PROGRAM LOGIC      ]
|
```